



A Case Study of Professional Football Club Mobile Application

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Abstract

This case study investigates a local football club mobile application by providing an overview of an official club app lifecycle. Previous studies have focused mainly on branding and marketing aspects of club apps. The motivation behind this study was to investigate how existing club apps could be improved by creating more value for the club and their fans. In sports business official club apps have become a trending solution to expand digital services traditionally offered in a club website. In general, there is not much diversity in solutions and content on different club apps. Majority of club apps lack interactive elements. This case study followed Yin (2009) guidelines. Both qualitative and quantitative research methods were used for data collecting and analysis. The data collection methods included a literature review, a comparison of different football club apps, the case study of the AC Oulu app, brainstorming new feature ideas, a development survey, and finally a conceptional specifications for the most potential new features. Both club and service provider sides were interviewed to identify the vision, the purpose, and collaboration behind the app. The AC Oulu's original intention behind the app was to keep it as simple as possible. The common features the AC Oulu club app is missing are push notifications, ticketing, e-commerce and registration. Digital ticketing and payment related features inevitably increase the app's complexity. The findings suggest that club apps should provide more interactive unique content and a high-quality user experience. Club fans expect club app to be developed further. The app should promote future match events more aggressively to possibly increase the number of people attending in AC Oulu match events. Although club apps are common, mobile app is not a necessity for a football club.

Keywords

mobile app, football, brand

Supervisor

Doctor of Philosophy, Elina Annanperä

Foreword

This research was conducted to AC Oulu football club and to Codemate Ltd. I would like to thank both for providing this opportunity to research the AC Oulu mobile application. They allowed me quite freely to perform this research project without any limitations or restrictions.

I selected this topic as football club applications were an intriguing subject to study. I personally follow football and AC Oulu closely. It was interesting to find out how existing club app solutions can possibly be improved.

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Acronyms and Abbreviations

API	Application Programming Interface
BaaS	Backend as a Service
CC	Country Code
CEO	Chief Executive Officer
CSR	Case Study Research
CRM	Customer Relationship Management
CSS	Cascading Style Sheets
FA	Football Association
FC	Football Club
GDPR	General Data Protection Regulation
GPS	Global Positioning System
HTML	Hypertext Markup Language
JSON	JavaScript Object Notation
MEMS	Microelectromechanical Systems
MOTM	Man Of The Match
OS	Operating System
PiA	Payment in App
PoC	Proof of Concept
PWA	Progressive Web Apps
SDK	Software Development Kit
UI	User Interface

1. Introduction

Apple released its first iPhone back in 2007. iPhone launch set standards to modern smartphones and open mobile applications community (Islam & Want, 2014). Technological evolution with rapid growth of smartphones has increased popularity of mobile device applications. Mobile apps provide a wide range of digital solutions assistance for everyday life. The amount of digital information and digital solutions has caused some individuals to constantly use their mobile phones with even some level of addiction. From this perspective smartphones can be seen as extensions of people themselves (Kang, 2017). People tend to have strong emotional attachment to their mobile devices (Bellman et al., 2011). Dominating platforms for mobile phone apps are Google Android and Apple iOS operating systems (OS) (Yang et al., 2018). Over the years competition has changed from device driven battle to rivalry of these two platforms (Bellman et al., 2011).

In sports business various digital solutions and popularity of social media has increased the interaction between clubs and their fans. Official club apps provide new possibilities to clubs in their digital marketing strategies. Almost all major football teams in Europe have their own tailored mobile app. In Finland only a few football clubs have tailored official apps. List of teams includes Helsingin Jalkapalloklubi (HJK), Ilves, Vaasan Palloseura (VPS), Turun Palloseura (TPS), Musan Salama (Musa), FC Jazz (Jazz), and AC Oulu (ACO). In general, the content and layout of these official football club apps is quite similar to each other. Official club apps provide mainly billboard only type information with very little interaction between the user and the application.

The purpose of this research was to study the official AC Oulu mobile app. The app is developed by Codemate Ltd to AC Oulu football club. AC Oulu is a local professional club playing in Finnish first division. The AC Oulu app provides information of upcoming matches, team line-ups, live scores, news, league standing, player rosters, player statistics and match highlights. The most innovative feature in the app is allowing users to vote AC Oulu man of the match (MOTM) in each AC Oulu game. The digital mobile app has replaced the paper version of match brochure in AC Oulu match events. The AC Oulu app is developed on a cross-platform framework Flutter. This thesis presents the possibilities to improve official club applications, mainly the app created for AC Oulu football club.

The research problem identified in this study was that official club apps lack interactive elements and rarely provide unique content compared to club's other digital channels. Study aims to find ways how official club app solutions can be improved and the interaction between user and the device can be increased. Previous studies have focused more on branding and marketing aspects of official sport club apps. There is a gap in club apps research focusing on how to improve already existing solutions. The motivation behind this study was to investigate the more technical side of club apps. Study aims to find ways how AC Oulu app can be improved as service to create more value for the club and their fans. The value in this case has multiple meanings. It can be defined as high quality mobile app, brand recognition, e-commerce, marketing potential, unique content, interaction, maintainability and quality user experience. Another aspect investigated in this study was that can some new app feature affect user's decision to participate in an upcoming AC Oulu home match.

This research was carried out as a case study based on Yin (2009) guidelines. Both qualitative and quantitative research methods were used for data collecting and analysis. The study included quantitative club app comparison, literature review, interviews, quantitative web survey, analysis, reporting the findings and discussion. All this was achieved by comparing existing football club apps, introducing prior research, interviewing both club and service provider sides, comparing archival records, and conducting a feature survey. The most potential new feature ideas emerged in this study were introduced to AC Oulu supporters in a web survey. Supporters ranked new development ideas based on their own preferences. This thesis presents all new emerged feature ideas. Based on all gathered data the most potential new feature ideas were processed into more detailed requirements and design mock-ups. Research findings highlight how existing football club app solutions can be improved by creating more value for the club and their fans.

The structure of this thesis is as follows. Chapter 2 presents prior research done in the sports apps field. This is followed by the research method chapter. Chapter 4 introduces the AC Oulu app and analyzes its content. Chapter 5 presents the results of this study. Chapters 6 discusses the findings and finally chapter 7 concludes the entire research.

2. Related Research

This chapter presents previous research covering professional sports related digital solutions. Chapter introduces different platforms for digital mobile solutions. User experience on mobile devices is covered briefly. Literature review focused mainly on research articles about digital solutions in football and other professional sports. Research articles were primarily gathered using the Google Scholar search interface. This digital space has not been researched very widely and mainly previous research focuses on branding and social phenomena of sports related mobile apps.

2.1 Official club apps

Official mobile apps for branded professional sports teams have become very common in the sports industry. It is part of the club's brand image and identity in the digital and social media space. Other Media defines on their website that a club app is an enhanced experience compared to a traditional website. A native mobile app can provide a more interactive and personalized user experience. (Other Media, n.d.)

Team websites have been the traditional channel to offer digital services around the club. Football clubs offer mainly all their transactional functionalities in their official websites. Typically, these functionalities include merchandise and ticketing. These services can be linked from outside resources or be part of the actual website design. The rise of social media and official club apps have provided alternatives to traditional team websites. Social networking sites allow clubs to connect with their fans and followers in new ways. Social media channels remove the middleman from the equation. Teams and their followers have a direct communication channel in social media. Mobile apps have become an important informational and transactional channel for football teams. Apps provide elements such as community, e-commerce, and time savings compared to traditional websites. Traditional websites still have an important role in football clubs especially in commerce transactions. Interfaces in social media and mobile apps usually utilize components from the club's website in their functionalities. (Jurisch et al., 2014)

Mobile apps have an important role in consumers' mobile experience. According to Ipsos MORI (2017) study 93% of smartphone users use mobile apps. Sport apps are consumed by 29% of male and 10% of female smartphone users (Ipsos MORI, 2017). Popularity of mobile apps has attracted known brands to use mobile platforms in their marketing schemas. Mobile apps provide access to content and services anytime from anywhere in the world (Kim et al., 2013; Ha et al., 2015). Smartphones provide alternative ways for sport consumers to connect with their favorite sport teams. Mobile apps offer an easy way to access their favorite sport (Ha et al., 2015). Jurisch et al. (2014) study suggests that the importance of official team websites is declining and there is a need for new mobile solutions. In 2019 Finland 83% of the entire population had smartphones for their personal use (Tilastokeskus, 2020). 79% of Finnish population uses the Internet daily (Tilastokeskus, 2020). In April 2020 mobile operating system market share in Finland was 72,3% obtained by Android and 27,38% by iOS (StatCounter, 2020).

Club apps are primarily designed for club fans. Key is to remember that a fan is not an ordinary customer. Digital marketing in sport is fan driven and fan loyalty must be earned. Understanding the customer is an important element in designing the app (Other Media, n.d.). Official team mobile apps are typically free to download and require Internet connection (Watkins & Lewis, 2014). Bellman et al. (2011) define a branded mobile app as downloadable software that provides brand identity through the user experience. The brand is usually mentioned in the app name and their brand logo appears in the content or in the app icon.

Official club apps are mostly used on match days. A mobile app should provide something different compared to a club website. Growing the app's userbase constantly is important. App content should be designed with an agenda to get fans using the app more outside game days. Match days are also important, so usage growth on match days is required for an app to be successful. (Davis, 2017)

2.2 Branding the app

Popularity of mobile apps have resulted many brands to quickly conquer this new marketplace. Branded mobile apps can be defined as interactive advertising. Well-designed branded apps can have a positive impact on the brand. An app can increase the interest in the brand. Smartphone app stores are commonly very competitive marketplaces. It is very hard to get recognition in the app store. App launch usually needs a separate marketing campaign to be successful. Downloading the specific app indicates that a user is interested in the specific brand. Usually the main advantage in an app is that it can provide unique features compared to traditional websites through different smartphone functionalities. Branded apps can be a very effective advertising forum for companies. Bellman et al. (2011) study results show that apps can change consumers intentions and attitudes. Apps can even increase the interest into the whole product or product category. Study notes that consumers want apps to rather provide information in a pull format than in an annoying push format. Difference in pull and push marketing is that in pull marketing consumers themselves seek the information rather than information is pushed to customers without their control. In branded apps consumers make the decision to download the app to their phones. Downloading an app can be seen as pull marketing. (Bellman et al., 2011)

Smartphone users may download and try an app just for fun or curiosity. For this reason, it is important to be able to keep customers happy and continue using the app. This can be achieved providing services to support user activity and fandom. An app should create a positive image about the club to a user. Apps should be marketed through other social media channels. Apps are a good example of self-advertising. When an app is downloaded an access point is created automatically for each user's smartphone. (Ha et al., 2015)

2.3 Fan loyalty and fan engagement

Yoshida et al. (2014) define fan engagement as a specific form of customer engagement in the sport context. Customer engagement is defined as a consumer's spontaneous, interactive, and co-creative behaviors primarily in a non-transactional consumer company to achieve individual and social purposes.

According to Bauer et al. (2013) fan loyalty is the driving force in the sports industry's commercial success. A fan can be defined as a loyal supporter of a team or supporter of a specific sport in general. Fans can have a desire to be as close as possible to the club and everything that is happening around the club. Enthusiast fans look for new ways to

get more intimate access to the club. Fans can be proud of their favorite club's success. They follow and support their club in both good and bad times. (Other Media, 2018)

Other Media (2018) research describes the following details about fans. Fan usually has a connection with his or her favorite club. The connection to their club can be their birthplace or family history in that specific place. This connection to the club can be defined as a part of a fan's identity. In this aspect the logo, team colors and the place where the team is playing are important for the club identity from the fan's perspective. These three listed things create a specific brand identity for a club (Other Media, 2018). Fans are not limited to local sports. Fans can basically follow any game around the world through different streaming services. Major teams' fanbases are growing globally. As an example, Manchester United has 659 million social media followers around the world. Less than one percent of these followers' travel and attend their home matches (Performance Communications, 2016).

Other Media (2018) divides fan engagement into four different areas: host fans, connect fans, enhance live experience, and bringing fans closer to the live action. *Hosting fans* covers arranging events to the fans on the match venue when there are no matches for instance stadium tours or some promotional events. Fans appreciate players' interaction with the community. *Connecting fans* is off the actual match event anywhere using the mobile device. This can cover match tickets, team news, press conferences, behind the scenes content, special offers, etc. *Enhanced live experience* covers what is happening in the match event at the venue. This can cover mobile ticketing, stadium instructions, beverages ordering, special offers, and post-game reactions and analysis. *Bringing fans closer to the live action* covers fans who are not on the venue during the match event. This can include live video and audio, gameday live updates including scores, reactions, stats, and post-game analysis. It is important to remember that the fans who are not able to participate in the actual match event are equally important. Other Media define a native mobile application as the club's home ground at each fan's smartphone.

2.4 Mobile generation

Younger sports fans have been using smartphones almost their entire lives. Nowadays mobile phones are an inseparable part of so many people's everyday lives. Based on this angle mobile experience should have a high priority in the club's digital marketing strategy. Fans should be able to access the latest data from anywhere at any time. Understanding the club's fan base is an important aspect when digital solutions are planned and developed. (Other Media, 2018)

Customers expect services to deliver seamless digital connectivity and quality to support their decisions. Social media has increased connections between the club and their fans. Already existing social media platforms have decreased the costs to generate content with higher quality than before. Clubs need to innovate and try new things to engage a new generation of fans and deliver something extra for already existing fans. (Dellea et al., 2016)

According to Kang (2015) study, younger fans look for information about team roster, team statistics, players, schedules, photos, injuries, team management, and social media. Mobile content is important to a studied sample of young fans. Young fans can identify themselves with a sports team. They do not necessarily attend matches, instead they interact with the team in a parasocial manner through different social media channels.

2.5 Mobile marketing

According to Kim et al. (2013) branded apps allow companies to engage customers efficiently. An app should provide consumers a unique experience with the brand. Kim et al. (2013) define the following engagement attributes for mobile apps: vividness, novelty, motivation, control, customization, feedback, multi platforming, and various entertainment features. For the club owning the actual application content is important. By owning the app club can define themselves and offer fans specifically what they need (Other Media, n.d.). Branded apps create opportunities for sponsorship and promotion in the app's free space. Advertising campaigns need to be in balance in successful branded apps (Ha et al., 2015).

Users characteristic data such as age and gender could be analyzed for sponsorship opportunities (Ha et al., 2015). Interactions with different digital services would allow profiling each individual fan. Data such as where a fan likes to sit in the stadium, what he eats in the stadium, which video clips he likes to watch, which players shirt he buys. All this could allow clubs to deliver personalized experience for each registered fan. To be efficient this would require a good integrated CRM system (Customer relationship management). (Dellea et al., 2016)

2.6 Typical club app features and characteristics

Watkins and Lewis (2014) study of official branded sports team mobile apps revealed that every app in their study had a media and news section. Live coverage of matches was available in 64% of apps. About 50% of apps had a possibility to buy team merchandise, and 75% of the apps allowed buying tickets to upcoming matches. Player profiles and performance statistics were available in 87% of studied mobile apps. Around 50% of apps had information about the team's stadium when arriving at the match. Almost all 94% of studied apps contained a team logo and 93% of apps were designed using the team's colors. Identification is an important element in fan engagement. Watkins and Lewis (2014) concluded that apps are developed in directions where fans find relevant information that is useful for them. (Watkins & Lewis, 2014)

Watkins and Lewis (2014) study stated that apps do not promote their team success. Only 11.1% of apps introduced star players (5.6%) and their head coach (16.7%). Study defined these details as unique elements that were not commonly used in mobile marketing or branding strategies. One example was that last season's champion did not promote their champion status at all in their mobile app. Star players could be easily used as a promotion in the app. Another unique feature is the possibility to check in the application when participating in the actual match event. Around 40% of studied apps had this feature. Only 25% of apps had the possibility to connect with other fans with personalized profiles. Chat forum for fans was available in 20% of apps. So only a small portion of studied apps provided features with social interaction. Typically, mobile apps are integrated with other social networking services including Twitter, Facebook, and Instagram. This adds possibilities for a fan to connect with the team through these services. (Watkins & Lewis, 2014)

According to Other Media (n.d.), an app should be instantly recognisable as part of the club's digital space and users should feel familiar using it. User experience should be similar with different devices and platforms including Android, iOS phone and a tablet. App layout must be responsive to different screen sizes. Application user interface (UI) must be intuitive to use. Other Media (n.d.) lists: live audio commentary, team news, scores, live press conferences, customisable live push notifications as important features for a club app. An app should be seamlessly integrated with other club data feeds such

as their website. An app can provide additional features or exclusive content to users who subscribe to additional membership. One possibility to receive extra revenue is to provide a possibility to easily renew season tickets through the app. (Other Media, n.d.)

Ticketing for major football clubs has become almost entirely a digital process. Similarly, fan merchandise sales mostly happen online. Everything happening around the club creates a desire to access the club community digitally with different devices and platforms. There are no limits in creating and delivering this content to the club's digital ecosystem. Dellea et al. (2016) study suggests that exploiting live match data provides new business opportunities and marketing strategies. Player performance measurement data allows a fan to receive real-time data of his favorite player performing on the pitch. The source for this data would be wearable technology on players. (Dellea et al., 2016)

2.7 Mobile app technologies

The evolution of mobile phone platforms and tools have parallelly made the basic requirements of mobile apps less complicated and more complicated at the same time. While there are only two different platforms for mobile apps: Google Android and Apple iOS. Native software development kits provided by platform vendors are natural choices as a framework for development. Cross-platform development frameworks have become powerful, and systems have progressed through time. Fragmented ecosystems with multiple different devices cause problems for service providers. This includes manufacturers' different Android versions and other peripheral devices such as smartwatches and fitness devices. The evolution of mobile technology is still very rapid. Native apps, cross-platform apps, hybrid apps, and web apps make things tricky. There is no ultimate definition on how cross-platform apps should work. None of the technologies is superior compared to others. Cost efficiency of cross-platform tools have increased in popularity compared to native frameworks. A huge number of constantly increasing different frameworks and solutions cause developing communities and approaches to be fragmented. (Majchrzak et al., 2018)

Web apps allow similar functionalities and behavior as native mobile apps. Web apps are built using various web technologies to mobile devices. Key advantage in web apps is that those are not device specific and can be accessed from all platforms supporting HTML5 (Hypertext Markup Language), CSS3 (Cascading Style Sheets), and other web standards. Web apps can be accessed using a default mobile device browser. Web apps should run and perform similarly in most devices' browsers. HTML5 standard has been developed with focus on supporting mobile devices. HTML5 also supports mobile device's geolocation. This allows utilizing Global Positioning System (GPS) location based map services to the web app. CSS3 provides a responsible layout for different screen sizes and resolutions. CSS3 allows use of effects without images or JavaScript. JavaScript allows different functionalities and behaviors to imitate native apps. Web apps can provide a launch icon to mobile device home screens similar to native apps. A splash screen in the opening can mimic native app's launch screen. Forced full screen mode can remove address and toolbars to maximum screen area. Cache manifest file allows web apps to store data on the user's device for offline access. Advantages in web apps are that a software engineer can work with chosen software and platform instead of a forced framework or software development kit (SDK). Engineers can work with simpler languages such as HTML, CSS and JavaScript. Web apps typically have a lower maintenance cost. Web apps are easy to produce and implement. (Sin et al., 2012)

Web-based hybrid mobile apps are similar on all platforms. These apps are built using common web standards such as HTML, CSS, and JavaScript. Hybrid apps are provided

using native packaging in app stores (Majchrzak et al., 2018). The reason for popularity of these web-based hybrid apps are technical challenges of native mobile apps with cross-platform compatibility. Generally developing hybrid apps is less expensive compared to native mobile apps. Hybrid apps allow existing knowledge and web components to be used directly. Hybrid apps are compiled using a cross-platform wrapper. Tools allow them to be released in mobile app stores. Disadvantages in hybrid apps are restricted access to hardware features, weaker user experience, and decreased performance compared to native apps. (Malavolta, 2016)

Cross-platform frameworks' major advantage is that code needs to be developed only once to reach several platforms. Majchrzak et al. (2018) divide cross-platform tools into two categories: runtime environments and generative approaches. In the first category apps are run in a virtual environment instead of directly on a platform. Generative approach aims to deliver a native app for each platform. How this is achieved varies on each framework. (Majchrzak et al., 2018)

Web apps are developed with basic web technologies, but a huge variety of different frameworks provide multiple options. Majchrzak et al. (2018) suggest progressive web apps (PWA) as a new way to develop mobile apps. PWAs combine web technologies with native app features. PWAs decrease app size drastically without a major cost on app performance. Options and performance have been improved with dependencies to compatible browsers. One benefit is that PWAs store minimal data to the user's device. PWA is basically a regular web site with JavaScript Object Notation (JSON) based metadata document where background routines are written in JavaScript. Disadvantage is that iOS is missing support for PWAs. Apple may be protecting their ecosystem as PWAs allow installation through browsers instead of official app stores. (Majchrzak et al., 2018)

Some application solutions may still require use of native applications. Web apps cannot always interact with device hardware similarly as native applications. Web based technologies cannot guarantee behaving the same on all mobile device browsers. Web apps do not receive similar visibility as the most popular mobile apps in app stores. (Sin et al., 2012)

An exact definition of cross-platform apps, PWAs, and web apps cannot be defined exactly as apps can include elements of others. Characteristics of each category are not defined precisely. Native app development scales workload almost linearly depending on supported platforms. This usually means that skilled developers need to be hired on each platform separately to achieve the best quality product. Mobile apps must be available on all major platforms to reach as many potential users as possible. (Majchrzak et al., 2018)

2.8 User experience

A mobile app should always serve its original purpose. The focus in content should be on what is the most relevant for its users (Hoehle & Venkatesh, 2015; Kortum & Sorber, 2015). Designers should keep the app similar on different screen sizes and platforms (Kortum & Sorber, 2015). The main purpose is to serve users expectations. An app should be designed generally well. App layout should be planned and designed carefully to achieve the highest possible user experience. (Hoehle & Venkatesh, 2015)

A user should not be required to input the same data twice. App should be ready to be used almost immediately after it is launched. Delays and loading times can frustrate users. Horizontal and vertical usage should be considered in the design phase as mobile

devices can be used in both ways. Images and graphics should enhance and support user experience (Hoehle et al., 2016). Graphics in the app should be aesthetically appealing for a user. Small sizes of mobile devices screens set restrictions on how users can interact with them (Harrison et al., 2013). Inputting data should be easy. Controls should be apparent and intuitive to use. Fingertip controls are a significant part of overall usability of mobile apps (Hoehle et al., 2016). Application settings should be easily defined once. A user should not be forced to adjust app settings frequently. Standardized user interface elements should be used as users are probably familiar with them already. (Hoehle & Venkatesh, 2015)

Design elements should be ordered logically to achieve users to navigate easily on small mobile device screens. Extensive usage of animations should be avoided in apps as too many animations may distract users on small screens (Hoehle et al., 2016). Detailed usability testing helps developers to modify functionalities of the app and improve its overall usability. (Hoehle & Venkatesh, 2015)

3. Research Methods

This chapter presents the research problem and the research questions. Chapter will also describe the methodology and different approaches to gather research data.

3.1 Case study

Case study was selected as a research method for this study. Case study research (CSR) is an exploration that focuses on describing, understanding, predicting and controlling the specific process (Yin, 2009 p. 4; Woodside, 2010 p. 1). CSR can be described as an attempt to answer who, what, where, when and how questions (Woodside, 2010 p. 11). A researcher should understand different actors, interactions, views and behaviors taking place in the studied process. Observing individual and group behaviors through time provides key variables for studied events. Beliefs and different views can provide additional variables for the study. (Woodside, 2010, p. 16)

This study includes both qualitative and quantitative methods for data analysis. The assumption was that collecting different types of data provides more complete understanding of the research problem (Creswell & Creswell, 2018, p. 54). Different methods used in this case study include a qualitative case study of the AC Oulu mobile app. Quantitative systematic comparison of existing football app solutions to prove how similar or different the apps are with each other. Finally, a web survey was done to collect user opinions about new features to support research findings. Convergent mixed methods were used to provide comprehensive analysis of the research problem. Both quantitative and qualitative data was collected simultaneously. Data was analyzed separately and combined in the results (Creswell & Creswell, 2018, p. 52).

Case study is a challenging research method. Goal in the case study is to collect, present, and analyze data without any biases. Case study structure includes comprehensive literature review while carefully thinking of research questions and research objectives. Study procedures need to be systematic and formal. Case study as a research method typically answers how and why type of research questions. A case study researches current phenomena rather than historical events. An information system is studied in a natural setting. Different cases are usually part of a larger phenomenon. A case study can be a combination of different research methods like a survey within a case study. (Yin, 2009, pp. 3-13)

Yin (2009) defines a case study with twofold definition. The first definition is “A case study is an empirical inquiry that investigates a contemporary phenomenon in depth and within its real-life context, especially when the boundaries between phenomenon and context are not clearly evident” (p. 18). The second definition is “The case study inquiry copes with the technically distinctive situation in which there will be many more variables of interest than data points, and as one result relies on multiple sources of evidence, with data needing to converge in a triangulating fashion, and as another result benefits from the prior development of theoretical propositions to guide data collection and analysis” (p. 18).

Single case studies are the most common designs for case studies. A case should represent a typical case, or a critical test of existing theory, or a rare circumstance, or revelatory case, or longitudinal purpose. Typical single case study can represent a capitulation of circumstances and conditions of an everyday situation. Single case design requires a comprehensive investigation and research of the case to avoid the chances of misinterpretation. (Yin, 2009, pp. 48-53)

Case study analysis is considered as the most difficult stage in a case study. Analysis section should present that all evidence was considered in the study. Study should be done thoroughly without any loose ends in the results. Strategy should widely cover key research questions with rival hypotheses. There should not be room for alternative interpretations from evidence that was ignored. Possible rival interpretations should be covered in analysis. All negative findings should be reported in the study. Researchers should demonstrate their expertise on the study subject. This can cover thorough thinking, previous knowledge of investigations and publications. (Yin, 2009, pp. 160-162)

3.2 Qualitative research

Qualitative research is commonly defined as research with a focus on phenomenon in a relatively natural setting. Qualitative research is not a mathematical data analysis process. It focuses on identifying normality, relationships, patterns, generalizable findings from the real world. This can be achieved using systematic protocols and techniques to develop and test theoretical models or propositions in scientific manner. It is a highly methodical research process. Qualitative research is widely used in various areas including business, management and organizational research. Research method has made an entrance to areas where it was not commonly used including accounting, finance, and information systems to name a few. (Cassell et al., 2017 pp. 2-27)

Qualitative research suits well for exploring an emerging phenomena and spotting new theory development instances. Qualitative research uses interviews, observation, videos, and documents as a source of data. Typically, there are many different sources for gathered data. Interviews in QR usually consist of semi-structured or indecisive questions. Common challenges in qualitative research are that it requires significant time and commitment from a researcher. A researcher needs full access to research sites to be able to execute profound investigation. Researchers should be creative and actively explore different styles of research processes. Researchers should have a fine balance in precision and creativity. The goal is to create empirically valid insights that are theoretically groundbreaking. (Cassell et al., 2017 pp. 19-27)

Creswell & Creswell (2018) suggest focusing on a single phenomenon in a research project including exploration of relationships and comparisons (p. 179). This research focuses on investigating AC Oulu football club app characteristics. Study includes investigation of the AC Oulu and Codemate business relationship and comparison of different football club apps features. Majority of collected data in this case study is qualitative data. Qualitative data analysis in this study includes simultaneous procedures and transcribing the interviews. Data is simultaneously processed as it is collected to help with future procedures. Transcripts provide a data source to quickly check the findings instead of finding specific information from audio recordings. The research subjects' AC Oulu and Codemate are not hidden to ensure that readers know where study is performed (Creswell & Creswell, 2018, p. 180). This way readers can get a better understanding of the entire study.

3.3 Research questions

The main research question covers the studied phenomenon extensively. In qualitative research the target is to explore the general, complex set of factors surrounding the phenomenon to present the topic widely from different perspectives. The second research question supports the main research question narrowing down the focus of the study. The main research question is constructed to answer the how question, which is typical adverb for qualitative research question. (Creswell & Creswell, 2018, pp. 192-193)

Research questions for this study were following:

RQ1. How to improve AC Oulu app as a service to create more value for the club and their fans?

RQ2. Which new app features can increase the amount of people attending AC Oulu match events?

Purpose of this study is to find new solutions and ways to improve professional sports team mobile apps. RQ2 aims to find solutions to increase overall attendance in AC Oulu home matches with the app. In this study, the value has multiple interpretation and meanings. From a club perspective, the value can be defined as high quality mobile app, brand recognition, usability, maintainability, e-commerce, and marketing potential. The value from fan perspective can be defined as providing unique content, interaction, quality user experience, and as a complete solution. A club app that provides valuable features for fans and followers can increase the number of active app users. A high number of active users is a necessity for a successful app. Target audience for this study are professional football club staff and software industry experts providing these solutions.

3.4 Research design process

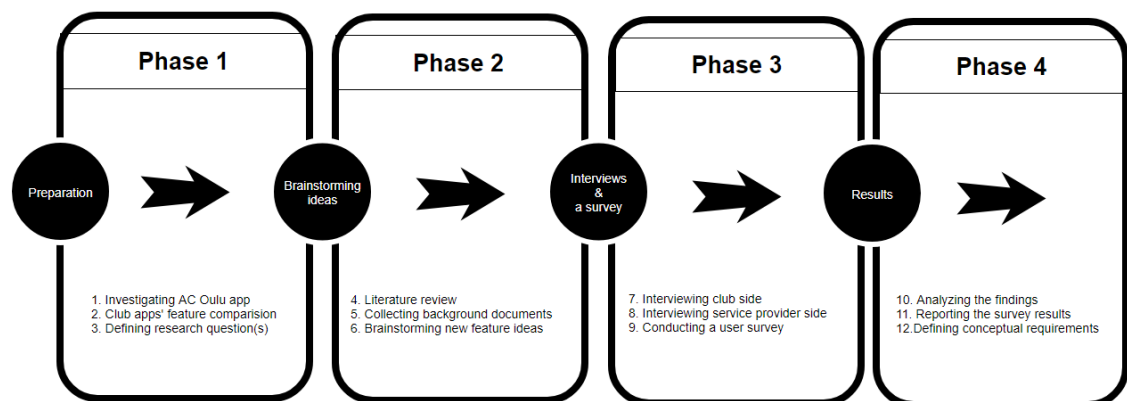


Figure 1. Research design process.

A research design is a logical plan for the study to answer research questions and finding the answers (Yin, 2009 p. 26). Figure 1 shows four different phases carried out in this study. Phase 1 included preparations for the study. Phase 2 included literature review, collecting data, and brainstorming possible new feature ideas. Phase 3 covered interview sessions and conducting a web survey. Phase 4 included analyzing the findings, reporting the survey results, and defining conceptual requirements for selected new features. This research was conducted in a time period of around 8 months from fall 2019 to spring 2020.

The study was started by familiarizing with the AC Oulu app features and its functionalities. The app was studied and analyzed carefully. As a background for this study, a researcher used AC Oulu mobile app as a reference in the University of Oulu Interaction Design course. This helped to construct ideas how the app could be improved. The course also provided some background and new ideas for this research project.

This study was mainly done as a typical single-case study. In the beginning hypothesis was that official football club apps are quite similar to each other. That is one the reason why this study focuses on a specific app designed for a local club AC Oulu. Background research included systematic features comparison with other football club apps. Domestic and foreign club apps were tested and investigated for comparison to AC Oulu app. This was done as a cross-case synthesis analysis to match feature patterns across different club apps. Yin (2009) suggests using cross-case synthesis when different groups of cases appear to share similarity and can be considered as the same type of general case (Yin, 2009 pp. 160-161).

The main research question was formed in the beginning of the study. Rival hypotheses regarding the main research question was developed and considered. The rival interpretation was that does a football club need an app? Can all the same benefits be achieved by optimizing a website for mobile devices? Different mobile and web app solutions were briefly introduced in the prior research section. This was done to find possible alternatives to official club mobile apps. Study was able to identify the most significant aspects of this study to answer how official football club apps can be improved.

Literature review was done to find out what kind of research has already been done in sport app digital space. Club and service providers key contacts were interviewed about the app. After analyzing the interview results prime new development ideas were collected into a list. Together with club and Codemate representatives an anonymous online survey was created to allow AC Oulu supporters give their feedback on the app, rank new development ideas, and possibly propose new ones. The results of the survey were reported back to AC Oulu and Codemate. Based on survey results and discussions together with Codemate and club representatives the most potential new features and design improvements were selected. These new features were processed to new requirements and design mock-ups. All different steps in this research were done based on Yin (2009) guidelines to achieve the highest quality research (pp. 160-161).

3.5 Data collection

In case study data can be collected in many ways. Yin (2009) lists six different sources: documents, archival records, interviews, direct observation, participant observation, and physical artifacts. Main objective is to collect data based on actual events and human behavior. It is important to use many different sources as evidence in data collection. There is not a single definitive source of evidence. Multiple sources should always be considered. (pp. 99-101)

Documents have a comprehensive role in any case study. Source documents should be handled carefully as they may not be accurate or contain bias. Collected data should be ensured from various sources to avoid false information. Case study should always take place in a natural setting. It creates a possibility for direct observations. Instruments for observation can be developed as part of case study protocol. Observations often give more information about the studied topic. (Yin, 2009, pp. 103-110)

Yin (2009) defines three important principles to follow in the data collection process. In case studies, the data collection process is more complex compared to other research methods. Principles create a basis for data gathering but are not strict guidelines to control the researcher without freedom. Goal is to make the process explicit, so the results are reliable and provide a solid ground for further analysis. (pp. 114-124)

1. *Use multiple sources of evidence*

Various data collection techniques should be used. This allows study to use multiple sources of evidence. Without multiple sources the main advantage of case study protocol is lost. As an example, if a study relies purely on interviews. Study can be defined as an interview study. (Yin, 2009, p. 118)

2. *Create a case study database*

Case study database allows search of the collected data. Researchers can categorize repeating similarities of documents and interview answers. A database should serve researchers needs, as it is not part of the final report. It should not be made as presentable but as usable instead. The most important thing in the database structure is that answers connect to questions with sufficient citations to actual evidence. (Yin, 2009, p. 122)

3. *Maintain a chain of evidence*

The principle allows a reader to follow evidence from a research question to conclusions. A reader can trace steps with evidence to their original source. No evidence should be lost in being careless with the study or any bias. Achieving these objectives will result in overall a better quality case study. A researcher has determined the construct of validity for the study. (Yin, 2009, pp. 122-123)

Main data collection methods used in this study were interviews, source documents, archival records and a survey. Use of direct observations as a method did not fit this specific case study. Data collection methods are explained more detailed in each subchapter of this research method section.

3.6 Comparing club apps and their features

Multiple mobile club apps were explored to identify common characteristics and features in official club apps. Comparison was done to find out how similar club apps are compared to each other. Total of 20 different official football club mobile apps around Europe were selected to feature in comparison. This comparison included all Finnish clubs (7 in total) that had the app available in January 2020. The rest were selected from the most popular football leagues in Europe. Seven apps from the United Kingdom, one from Spain, one from France, two from Germany, and one from Belgium. Swansea City AFC app from the second highest English division EFL Championship was selected as it is developed by Other Media and their material is referenced in this study. This part of comparison did not include club apps from other sports.

Cross-case synthesis suggested by Yin (2009) was used to analyze different club apps commonalities (p. 160). Matching patterns in the form of features were spotted from each studied app. Results of the comparison were presented as quantitative data (Table 3, p. 30). Goal was to find specific common features from the apps and compare the extent of different features across the studied club apps. Innovative and unique features

from studied club apps were also written down. By using and testing AC Oulu app and other football club apps a list of common and typical features was created. List included a total of 21 different features. The comparison was done by systematically going through the list and testing all selected club apps. Table 3 (p. 30) shows all the comparison data. Google Play Android versions of each app were selected as test versions. Apps were tested using a OnePlus 3 device with Android 9 OxygenOS.

As the AC Oulu app is the subject of this case study all its features except advent calendar were used in a comparison. Advent calendar was excluded because none of the other tested apps had a similar feature. The most common features were included in the study. If some app had some unique feature it was mentioned in the results. In some cases, features were generalized under the same subject. For example, if an app had integrated just one social media channel to the app. That fulfilled the “Social media channel(s) linked” feature. Quality of actual implementation of each feature was not compared in this part of the study. The comparison provided background to possible improvements to AC Oulu app.

Availability of official team apps in other sports was studied to get a wider perspective of how common team apps are in Finland. A quick comparison of ice hockey team apps was done to compare club apps availability between ice hockey and football. The comparison was done by checking all the highest ice hockey league teams (Liiga) apps availability from Google Play app store.

3.7 Interviews

Interviews are one of the most important sources in case studies. Conversations should follow the planned guide of case study protocol. Questions should be friendly and non-threatening. Follow-up questions can be more conspicuous. Interviewee should be handled as an informant rather than a respondent. Key informants are often an important part of case study being successful. They can provide insights on findings that researchers would not get access to. Informants can confirm or deny researchers sources of evidence. Interviewees answers should be considered cautiously. Interview results should be only seen as verbal reports. Responses have a common problem of bias, recalling wrong or imprecise articulation. For this reason, comparing findings with other sources is mandatory. (Yin, 2009, pp. 106-109)

Based on background research, questions were constructed for an interview with the AC Oulu club representative. Background research helped to create a list of possible new features, development ideas and improvements. Club’s CEO (chief executive officer) was selected as an interviewee. AC Oulu CEO has the best overall view of the club and the app. CEO has also participated in app designing workshops with Codemate. After AC Oulu side was interviewed to get a different perspective and better overall picture a service provider’s contact and a development representative were interviewed. A person responsible for collaboration between AC Oulu and Codemate was selected. In the same interview session app’s lead developer was also present, providing more technical side information. All interviews in this study were done as semi-structured interviews. Questions were delivered to participants in advance, so they were able to prepare answers before the actual interview session. Except new feature ideas were introduced in the actual interview sessions to avoid planting ideas in the mind of the interviewees. All interviews were audio recorded to analyze content afterwards. All interviewees granted permission to audio record the sessions. Based on the audio recording transcript of the interviews were created. Interviewees confirmed the authenticity of the content and that transcriptions were done correctly. Audio recordings will be deleted after the study is released.

Table 1. Key questions for interview sessions.

Club:	Service provider:
Q01C. Describe the origins of AC Oulu App	Q01S. Describe the origins of AC Oulu App
Q02C. App relation to club's other social media channels?	Q02S. What is the most important feature in the app?
Q03C. How much have you influenced the app content?	Q03S. Details about collaboration with the club?
Q04C. What is the most important feature in the app?	Q04S. The sources of app development ideas?
Q05C. Have you tested other club apps?	Q05S. Have you tested other club apps?
Q06C. What is the target audience of the app?	Q06S. Current status of the app?
Q07C. Current status of the app?	Q07S. Which integrations exist in the app?
Q08C. What age group is the app target audience?	Q08S. How is Flutter as an SDK for the app?
Q09C. The number of active app users?	Q09S. Is the app's maintainability easy?
Q10C. Any feedback from the users about the app?	Q10S. Some specific technical details of app
Q11C. The app as marketing channel for collaborators	Q11S. The number of active app users and match votes?
Q12C. Any new feature ideas for the app?	Q12S. Any feedback from the users about the app?
Q13C. Feedback on following feature ideas (18 total)	Q13S. Possible commercial potential of club apps?
Q14C. The future of the app	Q14S. The future of the app
Q15C. Profiling and user statistics of the app	Q15S. Resources to develop the app?
Q16C. Ideas to adapt mobile device functionalities better?	Q16S. The app as an ad for Codemate's know-how?
Q17C. Should someone else from the club to be interviewed?	Q17S. Any new feature ideas for the app?
	Q18S. Feedback on following feature ideas (18 total)
	Q19S. Opinion about a web survey to ACO supporters?

Interviews had in advance prepared a list of questions with planned follow-up questions. Table 1 lists key questions for both interview sessions. List of questions were constructed based on background studies. The goal was to get a better overall view of the vision behind the app and the collaboration between parties. Discussions and findings in the club side interview affected the service side interview. Interview sessions were quite relaxed and non-informal. All main participants in interview sessions had met earlier with each other. Conversation sessions were held in interviewees working place. Familiar environment and familiar participants helped with a relaxed atmosphere. Discussions in interview sessions lead to some unplanned follow-up questions and discussion. This helped to get wider coverage on topics discussed.

3.8 Web survey to supporters

Web survey was done to get feedback on new AC Oulu app feature ideas. AC Oulu app is designed for club supporters and followers. They are the actual target audience for the app. For this reason, it is important to get users feedback on possible new features. Survey results can indicate which new features should be processed further. A survey provides a quantitative description of trends and opinions of the target group by studying the sample of the group (Creswell & Creswell, 2018, p. 207).

Web survey to AC Oulu supporters was created based on discussions together with club and Codemate representatives. Collected data in both interview sessions affected the list of questions included. Especially, discussions about the most potential new features affected included feature ideas in the survey. AC Oulu and Codemate representatives reviewed the survey before it was released. AC Oulu supporters were selected as respondents as they follow the club passionately. In the beginning an assumption was that supporters want improvements to the app. Supporters may also have ideas how the app can be improved. Google Forms was used as a platform for the survey. Total of four sets of two tickets to upcoming season home games were drawn to individuals responding to the survey as a reward. Survey's terms of services were designed based on EU GDPR (General Data Protection Regulation) standards (European Data Protection Board, 2020). Privacy policy was reviewed by Data Specialist, Anna Rohunen from University of Oulu, Unit of Strategy and Science Policy. Respondents approved the survey terms before submitting the answers. Terms were that only a researcher had direct access to individual answers. Submitted answers were not individualized in any way. Submitting an email address was not mandatory. Submitted email addresses were not connected to answers. Collected data was stored in Google Drive cloud service. Data was used to this research project and to improve the AC Oulu mobile app. Report of survey results was delivered to both AC Oulu and Codemate. Survey was sent to a total of around 90 individuals via WhatsApp and Facebook Messenger groups. As submitting any personal information was not mandatory, a survey can have reached a wider audience. Web survey was open for one week. At the end of the week a reminder was sent to messaging groups, if someone still wanted to submit their answers in the later stages.

Table 2. The survey questions.

1. Approval of development survey terms	Mandatory	One choice
2. How happy are you with the current AC Oulu app?	Mandatory	Scale 1-10
3. How often do you use the app?	Mandatory	Multi choice
Very rarely, once a week, match days, on daily basis, multiple times a day		
4. What is the most important feature in the app?	Voluntary	Multi choice
MOTM voting feature Starting line-ups before matches Live text feed Pre match reports Match schedule Player profiles		
5. Do you use other sports team apps?	Voluntary	Yes/No
6. List of possible new features. What do you think of these? Rate with a scale of 1-10.		
Real-time live player statistics based on GPS signal, including head coach heart rate	Voluntary	Scale 1-10
Predicting the first goal scorer and time	Voluntary	Scale 1-10
Season and match tickets digitally in the app	Voluntary	Scale 1-10
Ordering and paying beverages in advance through the app	Voluntary	Scale 1-10
Digital wallet for quick payment in home games	Voluntary	Scale 1-10
Digital special offers to collaboration companies	Voluntary	Scale 1-10
Special offers in home games via the app	Voluntary	Scale 1-10
Fanstore in the app	Voluntary	Scale 1-10
Adjustable push notifications (game days, goals, line-ups, etc.)	Voluntary	Scale 1-10
Favorite players and voting the best player at the end of the season	Voluntary	Scale 1-10
Instagram linked to app with #acoulu tag and AC Oulu account with players public accounts	Voluntary	Scale 1-10
AC Oulu ACIAA -podcast directly in the app	Voluntary	Scale 1-10
Quick feedback feature of home matches	Voluntary	Scale 1-10
Quiz about club history and statistics	Voluntary	Scale 1-10
7. Own new feature or improvement idea to the app	Voluntary	Text
8. Free feedback of the app	Voluntary	Text
9. Email to ticket draw	Voluntary	Text

List of questions was constructed that allowed respondents to quickly submit their answers. Table 2 lists all survey questions. Most of the sections in the survey were voluntary to fill to allow respondents to skip questions. The scale in questions was set to 1-10 to allow more diversity compared to scale 1-5 in each section. List of possible new features in the survey were selected together with AC Oulu and Codemate. All feature ideas identified in this study were not included in the survey to keep the inquiry compact. The focus in the survey was how the app can be improved. Only 5 of 22 questions focused on the current app. The survey aimed to guide which new feature ideas should be developed further. Results should support the findings in this research.

4. AC Oulu app

This chapter introduces AC Oulu app background and functionalities.

4.1 Background

AC Oulu club values are being socially responsible, reliable, successful, honest, and proud. Their values in football are fighting, being proud, and brave. The club wants to operate close contact with its fans and followers. Club's future objective in football is to reach Veikkausliiga, the highest division in Finnish football. The club wants to provide success for its collaborators through the rising AC Oulu brand. Each year AC Oulu tries to achieve a positive turnover and expand its business models and investments. At the end of 2019 Club had a total of around 12 000 followers in different social media channels. In the future the club wants to reach a total of 20 000 followers in all social media channels. (AC Oulu, 2019)

The AC Oulu app is developed by a local IT technology company Codemate (AC Oulu, 2018a). Codemate is one of the main sponsor partners with AC Oulu. Codemate has been an AC Oulu collaborator since 2015. The collaboration between the club and Codemate have evolved and grown throughout the years. AC Oulu and Codemate have tried to develop and improve their collaboration the way both sides can benefit as much as possible. One of the most notable aspects in their collaboration is the official AC Oulu app. The application was launched at the end of 2018 season. AC Oulu and Codemate had discussed the official club app earlier, but without real results. Origins of the app go back to spring 2018, when inside the Codemate one person had an idea to create a digital solution to the best player voting for AC Oulu home matches. The app would allow all spectators to vote for the best player. Earlier the best players were decided by a small council in each AC Oulu home game. The app was officially released on 13.09.2018 for both Android and iOS devices (AC Oulu, 2018a). In the launch the app was marketed heavily in social media, roadside screens, local newspapers and using roll-up billboards in match events (Haataja, 2018). On the launch day AC Oulu app rose to the third spot in the daily App Store sports apps category. In the first game 25% of match spectators casted a vote for their favorite AC Oulu player (Haataja, 2018).

Collaboration between Codemate and AC Oulu is a good example of modern sponsorship in sports. Their collaboration schema is quite unique in Finland. It is not common practice that the app is developed using a pro bono model (professional work undertaken voluntarily and without payment) to a football club. In AC Oulu and Codemate collaboration, both parties can benefit greatly from the cooperation. Codemate and AC Oulu work in symbiosis together. Codemate gets good visibility through AC Oulu match events and in AC Oulu social media channels. AC Oulu gets the latest technical solutions for their digital services. The app works as a demonstration of Codemate's technical capabilities. As a result, AC Oulu, a small club in Finnish first division has an app that qualifies comparison to official European top teams' apps. The app and several years of collaboration with AC Oulu has created a positive image of Codemate as a tech company in a local community. Together with professionally operated social media publicity, the AC Oulu app creates a modern image to the public about the club.

4.2 The AC Oulu app status

The app is designed for all AC Oulu fans and club followers. There is no specific age group or gender defined as a target audience for the app. The main feature of the app is the best AC Oulu player voting feature for each match. The voting feature was also the first feature when the app was launched. The main idea behind the app is to bring the club, fans and sponsors closer to each other through the app.

App layout is designed with club colors and logo. App currently provides news feed integrated from the club homepage. App has AC Oulu TV with match highlights, pre-, and post-match interviews with players and staff. ACOTV is integrated from YouTube. The app provides a team roster with player cards, Player profiles include a short biography and the current season statistics. The app provides league standings for both Finnish first division and Suomen Cup. The app has a match schedule for both future and past games of the current season. All match events have a separate match center that covers both team line-ups and all match facts. Text feed includes goals, cards, and substitutes. Match feed live data comes automatically from Finnish Football Association result services API (Application Programming Interface). Each match center has a direct integration with specific match hashtag i.e. #KPVACO (KPV vs AC Oulu) to Twitter. This feature allows fans to comment and speculate about upcoming or ongoing matches. Posted tweets are available to all app users in the information feed. The match center has AC Oulu man of the match voting feature (Röngän Voimapelaja) when the match is in progress. The voting ends 105 minutes after the kickoff. This time period includes 15 minutes half-time and first half-half extra time. So, in normal circumstances voting ends just before the 90th minute mark in the match. After a person has casted his or her vote there is still a possibility to make a change before the voting ends. This feature brings interaction between the user and the club. For a Christmas time there is a 24 day advent calendar feature. Calendar includes revelation of new player contracts for the next season and inside stories. There are also daily special offers from collaborators and AC Oulu. The app content is only available in Finnish.

Season 2019 was a huge disappointment in results wise for AC Oulu. In the beginning of the season AC Oulu was one of the top candidates to win the Finnish first division. At the end of the season AC Oulu was 7th in the league ranking, only winning one home game. Playing so poorly in home matches affected average attendance negatively. The average attendance in the 2019 season was 945. This was 234 less than in the 2018 season. Season 2019 highest attendance in a home game was 1335 and the lowest 510 spectators (AC Oulu, 2019). In February 2020, the app had 777 active users. This covers 490 (63%) users on Android and 287 (37%) users on iOS. AC Oulu MOTM voting feature has around 100 voters in home matches and around 50 voters in each away game. The user data in the app is not profiled in any way. App does not have any features that require registration. Registration is avoided to keep the app as simple as possible. The number of app users and MOTM voters are only collected.

4.3 App layout and design

The AC Oulu app is designed with a club logo and identifying navy blue and white colors. A picture of AC Oulu's home ground Raatti stadium is used as a background image in the app. All these are typical characteristics Bellman et al. (2011) defined in their study of branded mobile apps. Figure 2 in the middle shows the default home view when the app is launched. In the bottom of the screen there is the main navigation menu. The main navigation from left to right includes a match schedule, league standings, home view, player profiles, and AC Oulu TV. Navigation between different views can be done either swiping the screen left to right or tapping an icon in the navigation menu. Currently active view is identified with a light blue icon. The app does not have an interface for horizontal use. The app is designed to be used vertically only.

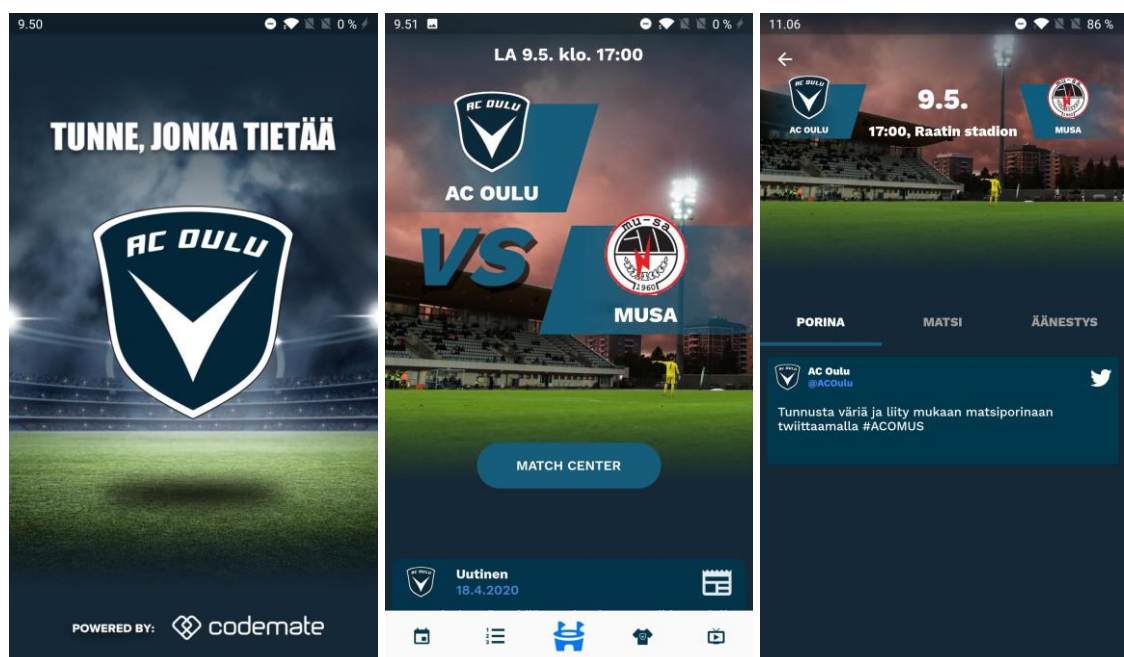


Figure 2. Splash screen, home screen, and match center.

Team roster view is displayed on the left in figure 3. In the middle there is a player profile shown and on the right individual player statistics are shown. Navigation in player profiles can be only done by swiping the list of players and tapping the player card open. Player profile includes a short player biography and current season statistics. Details include number of matches played, average minutes played per match, goals, assists, and cards.

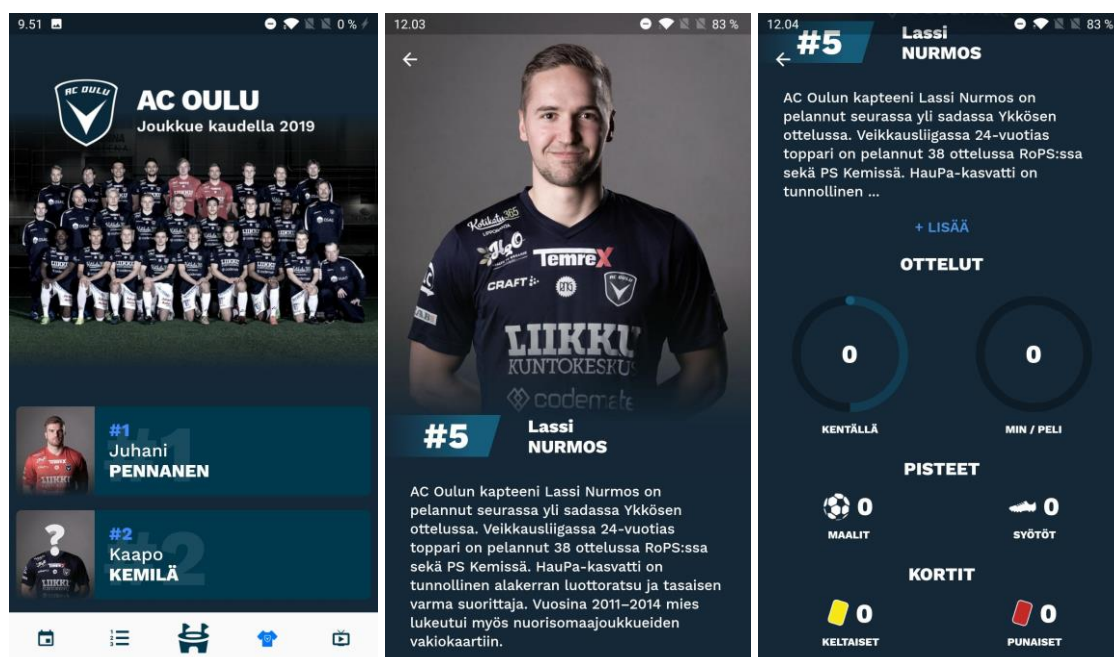


Figure 3. Team roster, a player profile, and player statistics.

Figure 4 presents the match center. On the left there is an information feed that includes match specific tweets from Twitter, pre- and post-game reports, and match highlights. In the middle screen match live text feed is displayed. Live feed lists teams starting line-ups and benches. Live text feed includes goals, substitutes, and cards. Each event has a specific timestamp. All feeds are updated in real time. On the right screen results of AC Oulu MOTM voting is shown. Navigation inside the match center is done by swiping left or right between views. On the top there is a navigation menu that can be operated by tapping the screen. Each view can be scrolled by swiping up and down. Match center can be closed by tapping the arrow icon in the top left corner or using the device's default back navigation functionality.

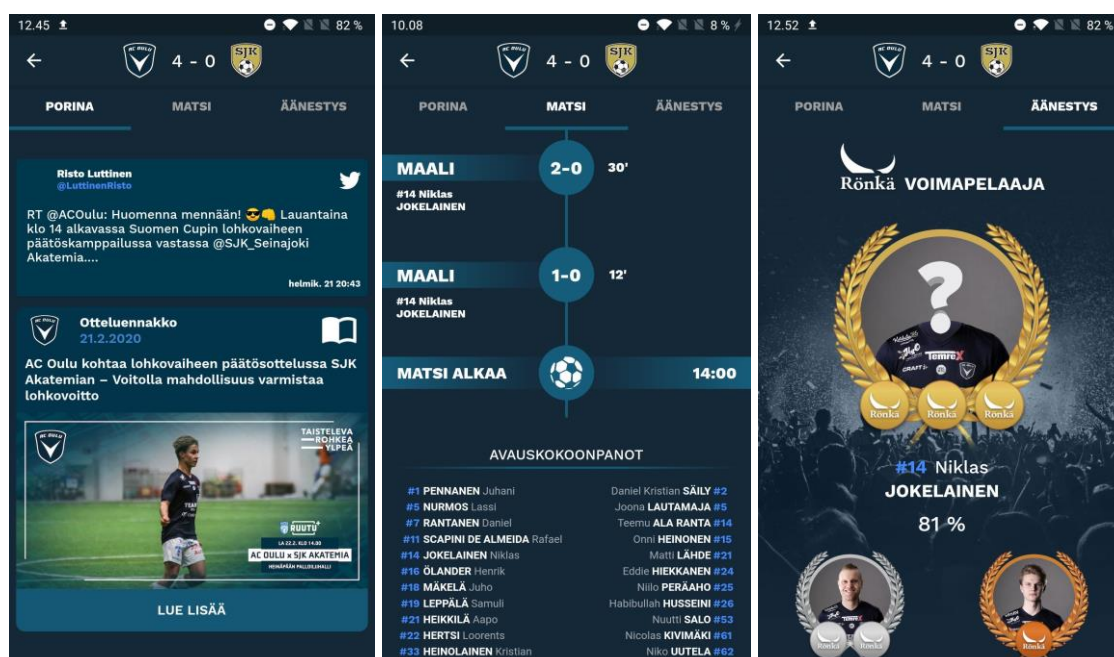


Figure 4. Match center: information feed, match live text feed, and MOTM voting results.

Figure 5 shows the league standings for Finnish first division. Second tab shows cup results. In the middle screen AC Oulu TV section shows all highlights and videos integrated from AC Oulu YouTube channel. The right screen shows the advent calendar feature for Christmas time.

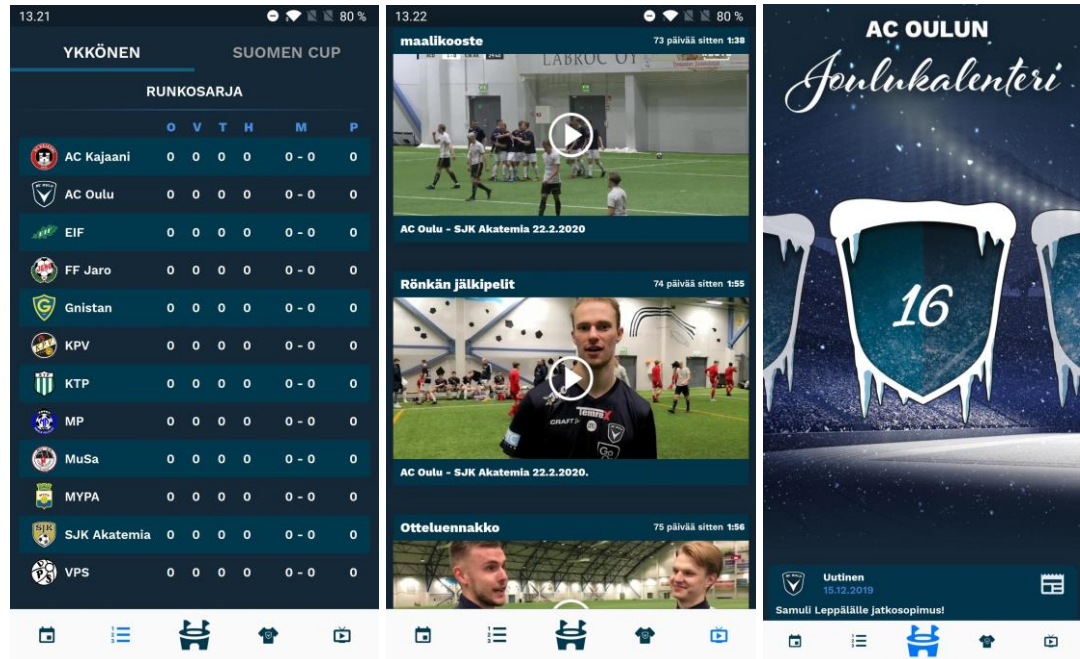


Figure 5. League standings, AC Oulu TV, and Christmas advent calendar.

The entire app design and structure is consistent in different views. For an app user all different features and functions can be executed similarly. The navigation in the AC Oulu app is similar to other common mobile applications. As Kortum & Sorber (2015) suggested in their study the app designed similarly for different screen sizes and platforms. By providing a familiar mobile user experience, the app is easy to use from the start. Users are not required to learn a new user interface.

5. Findings

This chapter presents the key findings from official club app comparison, interviews, feedback analysis, AC Oulu supporters web survey, conceptual specifications for new feature, the results reflecting research questions, and finally summarizes the findings.

5.1 Comparison of official football club apps

The comparison section includes 20 different official football club mobile apps around Europe. Table 3 lists all tested apps and 21 different common features. Country code (CC) column shows the origin of the club. Total column (T) shows total number of studied features in a specific app. The app comparison was done as a cross-case analysis.

The most common features across the official football club apps are club news, match reports and upcoming match schedule. In the results 95% of the sample group apps had these features. Registration was possible in 90% of apps. Only Ilves and HJK apps had the registration mandatory to allow the app usage. Adjustable push notifications were available in 85% of apps. All these applications allowed users to configure notifications themselves. The content in push notifications varied widely between apps. Typically push notifications included information about club news, live match alerts, game day reminders, and special offers. Team rosters, league standings, fanstore, and starting line-ups were available in 80% of apps. Ticket sales and match live feed were available in 75% of apps. Match highlight videos were provided by 70% of apps. Many of the major clubs in Europe have also a separate TV app with a wider range of video and live material. Club TV services typically have a monthly payment based subscription schema. Season specific player statistics were available in 65% of apps. There were differences in the content of statistics. Generally top tier teams provide more detailed statistical information of the players. Manchester United had the most detailed player statistics available. In their app Manchester United used a tailored Opta data service (Manchester United, 2019). Figure 7 highlights some of these Opta statistics.

Clubs provided special offers in 40% of apps. Social media channels were available in 40% of apps. Season tickets or match tickets were digitally available in 35% of the apps. A voting feature for the best player was available in 30% of apps. Difference to AC Oulu app is that these player votes did not affect the actual best player selection in the match event. A stadium map or arrival instructions were available in 25% of apps. An overall league goal scorers' standing was available in 20% of apps. A possibility to buy food and beverages in advance in a match event was possible in 15% of apps. Only the RSC Anderlecht app had a digital wallet option to load credit to the app and spend it on match events (5%). Based on statistics provided by Google Play, the number of installs varied from 100+ (VPS, Musa, and Jazz) to 5 000 000+ installs (Manchester United and FC Barcelona). Number of installs are still quite small compared to @ManUtd 21,7 million and 32,4 million @FCBarcelona Twitter followers. The most popular features that the AC Oulu app is missing are a registration option, push notifications, ticket sales, and a link to the fanstore.

The Dortmund app had most of the listed features available (18 of 21 in total). Many of the apps had other features that were not included in this comparison. Features missing included: radio, podcasts, quizzes, photo galleries, chat with other fans, check-in feature, fan club information, streaming matches live, games, songs, and enhanced camera with ability to add club themed visual effects. Some of the bigger clubs' apps also provided information about their reserve, youth and women teams.

Many of the tested apps use elements from the club's official websites, but there are differences in how seamlessly elements are implemented to the app. As an example of poor implementation, Tottenham Hotspurs app is built mainly using their official website. This affects usability quite negatively as almost everything except main navigation is executed using their website. This is not hidden in any way. Figure 6 highlights web elements with a red marker. On the left default app view is displayed. In the middle the first team view is opened and on the right player profile shows their default website navigation. This makes the general user experience very poor as the main navigation disappears. Web dropdown navigation confuses users as the app has jumped to Hotspurs website.

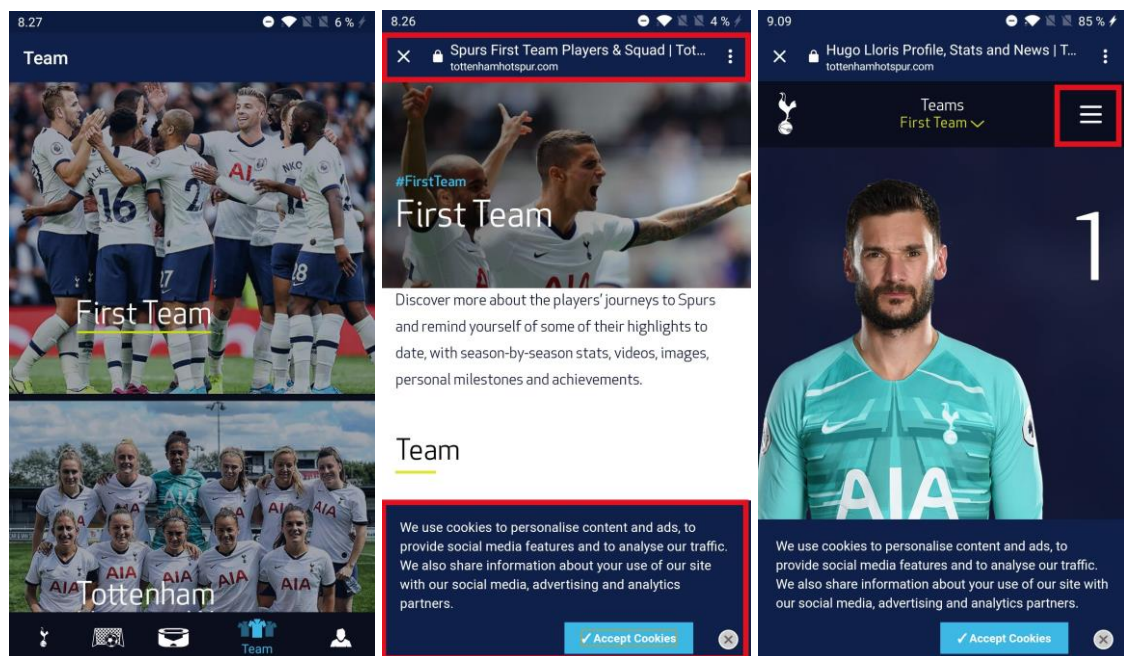


Figure 6. Tottenham Hotspurs app examples.

In Finland official club apps are more common in ice hockey where all Liiga teams have their own app. In the Finnish ice hockey league, most of the apps (8 of 15) are provided by Jääkiekon SM-liiga Oy to the teams. There is not much diversity in the content between the apps and these apps have the same design layout. All football club apps from Finland except HJK have a developer software company as a publisher in Google Play. Musa and FC Jazz apps are both developed by the same company Wisenetwork Oy. Both apps have the same design layout. All other studied official apps have been published under their own brand name.

Each of the tested apps had an equivalent app available in the Apple App Store. This way apps can reach the widest possible smartphone user base by covering both Android and iPhone ecosystems. Studied apps in this research were not tested using iPhone devices. For this reason, the conclusion that all the apps are exactly similar on both systems cannot be defined emphatically.

The most unique feature across all the tested apps was Manchester United's usage of Opta live statistics and match data feeds. Momentum data is calculated from duels won, crosses, forward passes, touches in the box, and possession (Manchester United, 2019). Figure 7 highlights some of these Opta statistics. Another unique feature was that Borussia Dortmund, Bayern Munich and RSC Anderlecht apps had a feature to take pictures with the device's camera. A user can add club themed visual elements such as club shirts and logos to captured pictures (Figure 8). Some apps allow sharing pictures taken on match days. Share functionality allows fans to share their match day pictures with the entire club community.

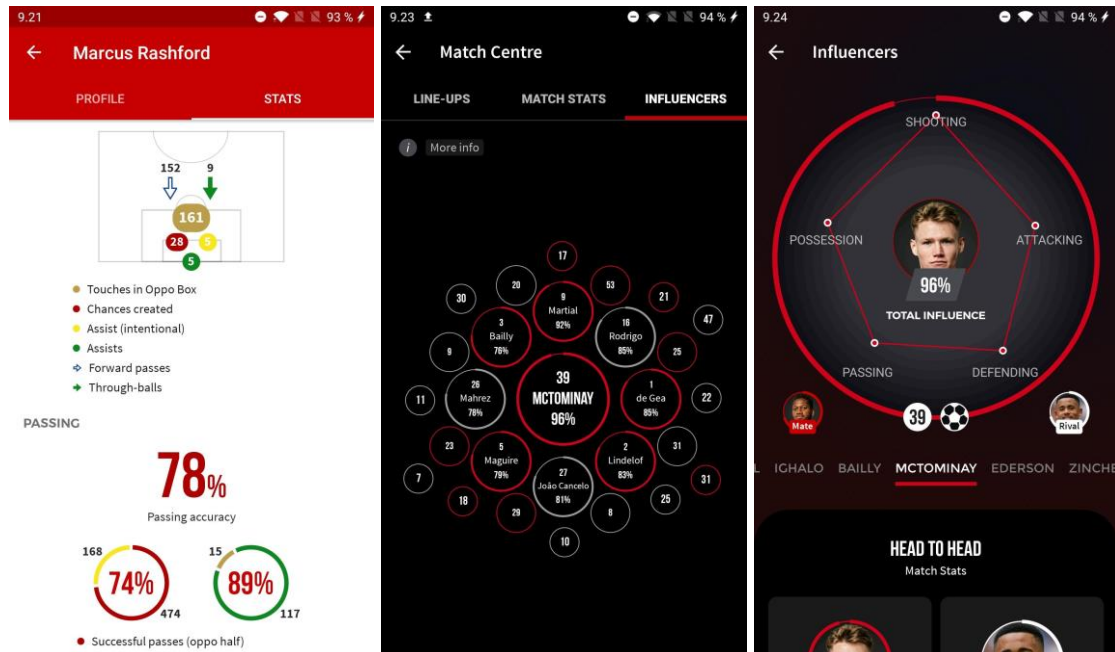


Figure 7. Manchester United app Opta statistics.

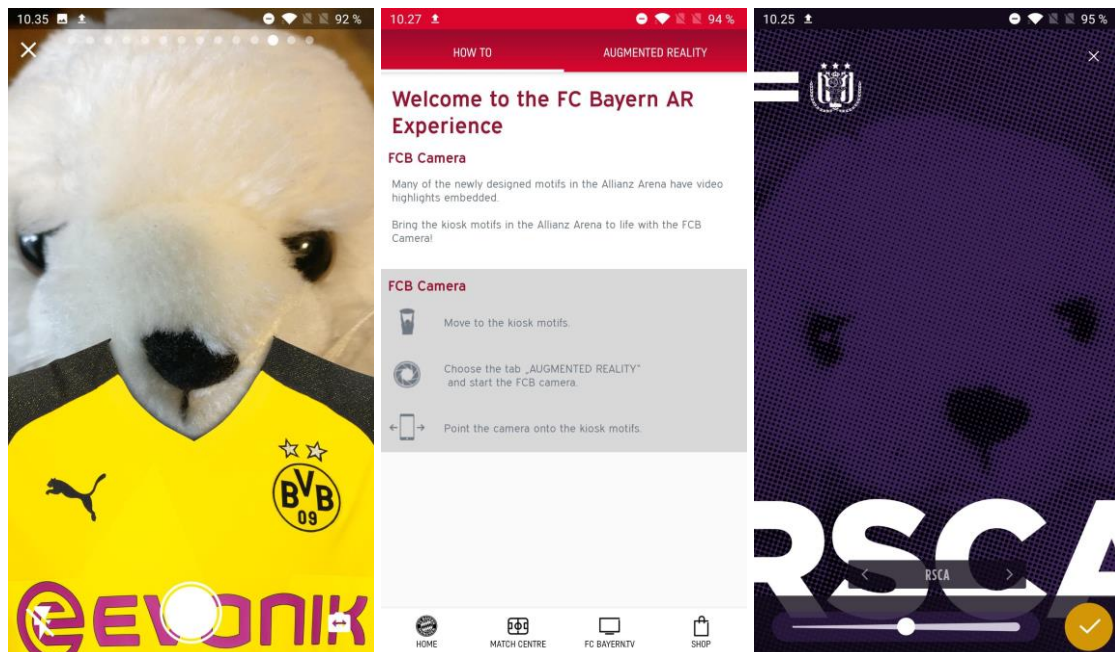


Figure 8. Augmented elements with device camera (BVB, FC Bayern, and RSC Anderlecht).

Based on features available in top tier teams club apps, the target audience is more focused on the fans abroad than on the match-going fans. To back this only 35% (7 of 20) of the apps had tickets digitally available in the app. Ordering food and beverages was available only in 15% (3 of 20). Digital wallet was only available in the RSC Anderlecht app. In most of the cases ticket sales function redirected a user to the club's website. In some cases, a user was redirected again from the website to a third-party ticket portal. The RSC Anderlecht app was the only of the tested apps where the entire ticketing system was integrated seamlessly to the app.

5.2 Interview results

This subchapter presents results from two interview sessions arranged with AC Oulu and Codemate representatives.

5.2.1 AC Oulu app initial release

In the beginning of the AC Oulu app development, the project team started familiarizing themselves with other official football club apps released in Finland. By comparing different apps, the project team noticed that apps were quite quickly put together, lacked real content, and provided very little interaction. Lead developer was free to choose the technology used in the app. One person inside Codemate had been working actively in the Flutter community in his spare time. In summer 2018, based on his recommendations, the relatively new open-source mobile UI framework Flutter was chosen as SDK.

Flutter is a cross-platform framework. Major advantage in Flutter is that only one app version needs to be developed. In the beginning, the lead developer did not have any previous experience of developing with Flutter. Developing with Flutter was relatively fast and easy for even newbies. Problem in the beginning was that SDK did not have all packages for native Flutter support. Also, some existing packages were not updated regularly and did not provide support to iOS (Lamminheimo, 2018). Back then, the Flutter framework was not yet used in other Codemate's production projects. In the beginning, management had doubts about cross-platform SDK. Previous experiences with other cross-platform tools had been generally bad. A visual demo version was a good way to test the technology before its real commercial use within the company.

Voting feature was first demoed and tested in the VIP-lounge with one iPad. This first demo version was done as a surprise gift to AC Oulu. Throughout the testing, Codemate quickly realized that just having a voting feature was not enough for a real app. Before the official release, additional features that were quick and easy to develop were included in the first release. The first version included a voting feature, match schedule, league standings and player profiles. In the beginning, app updates were released in two week cycles (Codemate, 2020). Project team tested multiple top tier club apps from Europe and compared those to the AC Oulu's app. Their conclusion was that AC Oulu app matches in comparison to the world's top teams official club apps.

5.2.2 App development

Flutter is a community based open source SDK. Components and evolution of Flutter SDK is completely dependent on the activity of its community. Flutter version 1.0 was released on December 4, 2018 (Lamminheimo, 2018). AC Oulu app's first version was released before SDK's official 1.0 release. From the beginning of the project, it was

clear that Flutter is the right platform for the app. According to the software engineer, development is fast and apps are easy to maintain. The code is intelligible for new developers joining the project. Maintainability is one of the key aspects in this project. Compared to React Native or having separate native development for both Android and iOS would make maintenance a lot harder. Creating a PoC (Proof of Concept) with Flutter is relatively easy even without previous experience with Flutter SDK (Lamminheimo, 2018). Another advantage in Flutter is that it does not automatically require update to the latest version. When SDK is updated to the latest version source code needs to be modified very rarely. The project can be updated with solely changes to app configuration. Service provider representatives thought that Flutter is a perfect SDK for the AC Oulu app. Today Flutter is widely used in other commercial Codemate's software projects.

The app has multiple integrations to other systems. Match feed live data comes automatically from Finnish Football Association result services API. Team line-ups are usually revealed 4 hours before kick-off in the service. Result service is based on the TorneoPal system. A live action query to the API is done in a 60 seconds interval. The individual player statistics are integrated from a database that is maintained by AC Oulu Supporters. AC Oulu app frontend is developed with Flutter SDK. Google Firebase is used as BaaS (Backend as a Service) for the app. Firebase includes a real time database, cloud storage, crash reporting and remote configuration. Service is scaled for 24/7 round-the-clock production usage with backup interfaces to avoid any downtime.

In the project's beginning Flutter as a new SDK caused a few problems. The carousel view used in the first version was not available as an existing package in the Flutter community. Iiro Krankka's Page Transformer package was used as a basis for a carousel view in the beginning. Help for different obstacles came from the Flutter community and the package author (Lamminheimo, 2018). Availability of native packages have improved as the Flutter community has grown and evolved. The Finnish Football Association (FA) result service can be under a heavy load on match days. It is quite common that there are some problems accessing the API on game days. For timeout problems, a cache routine was developed to the app. This way the system is not completely dependent on a results service. The result service integration is the most critical of the app integrations. Another problem in the beginning was that the TorneoPal system API is not logical, and it is missing proper documentation. According to the developer, it was time consuming to figure out everything. Other integrations have worked without any major problems. In some cases, the match specific Twitter hashtags can have different meanings in other languages. Occasionally this can cause irrelevant data to appear in the match center's Twitter feed. The club and service provider do not want to censor the Twitter feed in any way.

The app version 1.6.0 added localization to English, but it is now removed as being obsolete. The main customer base is in Finnish. English localization caused extra work to maintenance and development routines. Adding a localization is not optimized very well in the Flutter environment and it was a time-consuming process to implement it in the first place (Lamminheimo, 2018).

The app has been in maintenance mode since 2.0 release on 24th of May 2019. Each season the app needs basic maintenance routines. App's maintenance routines are automated as much as possible. Player roster, league standings, and match schedule are automatically received from Finnish FA result service API. Each season's manual maintenance routine includes updating player photos, player bios, and new team logos to the backend. Unofficial friendly games in pre-season needs to be manually updated to the match schedule. There is a separate user interface for a club to update content to the advent calendar in Christmas time. Development resources for the AC Oulu project

depends on a workload in other customer projects. Free resources can be assigned to the project when there is content in the production backlog.

The app works as a reference of Codemate's competence in technological digital solutions. On the other hand, Codemate as a publisher is not very visible in the app. Their logo is displayed for 5 seconds on the splash screen (Figure 2, p. 26). Simultaneously in the background, the application is loaded from the database. Both Android and iOS app stores show Codemate as the publisher. According to Codemate representatives the app has helped to create new customer connections. They commented that Codemate cannot be too visible in the app as it is still an AC Oulu app. AC Oulu CEO has encouraged Codemate to make themselves more visible in the app design.

5.2.3 The app's future

AC Oulu wants their app to be more than just a news channel. According to the club CEO, the app needs more elements that provide interaction. AC Oulu match events are especially important. In the service provider's side interview, the representatives commented that there must be a balance in the number of features in the app. Too many features can affect mobile app general usability negatively. New features need to create real value for the club. The app needs to be constantly developed to be better. This way users stay happy and continue to use the app. Challenging new development ideas without providing real value will be ignored. The main target in development is to increase the app user base and general usage. AC Oulu CEO's vision is that when spectators arrive at home games they all start the app from their smartphones and see a pre-game report, starting line-ups and possibly check today's special offers from the app. Payment and preorder of food and beverages features have been prototype tested on the service provider side. For the 2020 season this feature is on hold as it would not create enough real value for the club. Sales with current systems does not cause too long queues to stadium kiosks. Typically, there is a rush period on match half-time. There has been discussion of digital season and individual match tickets in the app with the current ticket service provider. This feature is also on a hold at least for the 2020 season as the parties did not find common ground and trust between each other. There are risks implementing such a big feature in a short period.

Codemate and AC Oulu have not agreed which features will be included in the next major release. Actual AC Oulu app release backlog in the early 2020 was empty. Payment options have been tested on prototype level for possible future releases. Payment related features need to be planned, designed, and tested precisely together with the club before the initial release. Nets provides a native PiA Netaxept (Payment in App) library for Flutter based apps. Adding ticketing and payment related features to the app would require a user management system. Codemate and AC Oulu have intentionally avoided implementing a user management system to the app. This is done to keep the app as simple as possible for the users. Another reason is avoiding dealing with EU GDPR regulations when collecting personal data. Implementing a user management system to the app increases the general maintenance work required. A user management system can be implemented if some new feature requires user data to be collected. User management would allow AC Oulu to profile the app's userbase. In the interview, club's CEO saw marketing potential in profiling.

The app would be easy to modify to other football clubs operating in Finland. The problem is that most of the football clubs in Finland do not have financial resources to invest to launch the app. On the other hand, the top six Veikkausliiga teams with better financial resources do not have official club apps available in app stores. The estimation

of their financial resources is based on the 2020 season reported player budgets (MTV Uutiset, 2020). AC Oulu contacts have tried to market Codemate to other clubs in Finland without real results. Alternatively, Codemate could try to market their solution to clubs abroad with better financial resources.

5.3 Feedback from app users

Feedback about the app from users has been only positive. Google Play rating is 4,8 with 29 reviews. The App Store rating is full 5 stars. The app has been developed based on fans' feedback both directly and from a club's Facebook survey. Codemate and AC Oulu arranged a Facebook feedback survey back in 2018. Key request in the survey results was having season tickets, match tickets, and ability to buy tickets directly from the app (AC Oulu, 2018b). Some elderly people have given negative feedback of missing physical match programs in home matches. After the app version 1.3 release team line-ups and match advance reports have been only available digitally in the app (Codemate, 2020). Physical match programs are generally one-time disposable goods. Having programs available only in digital format saves both paper and nature. Lately fans have not requested any new features for the app. Earlier satisfaction surveys have shown that the most important app feature depends on the user. Some find the most important that they know when upcoming matches are played, some want detailed player statistics, and others think that live match center is the most important feature. For this reason, it is important that the app provides something for everyone who downloads the app.

AC Oulu sponsors and collaborators have been pleased in their increasing visibility through the app. In home matches the host company is visible in the match center. The MOTM voting feature has increased Veljekset Rönkä Oy visibility as in each AC Oulu match "Röngän voimapelaja" is selected by the app users. AC Oulu wants to increase collaborators' role in the app. This way cooperation with them can be developed further.

5.4 Web survey results

The results of a web survey to AC Oulu supporters are introduced here. Total of 34 answers were received to the web survey. All 34 respondents answered all multichoice questions. Figure 9 shows that 67,6% (23 of 34) of respondents selected starting line-ups in advance as the most important feature in the application. The match schedule and MOTM voting feature were the second most popular features with 8,8% (3 of 34) votes.

Match schedule and MOTM voting feature could be more popular among more casual AC Oulu followers. Schedule reveals when home matches occur, and the app home screen always shows the next upcoming match. The MOTM voting feature creates interaction between the fans and the club as app users can influence who is selected as AC Oulu MOTM. In the results, features centralizing around the match event were selected as the most important ones. To back this 70,6% (24 of 34) of respondents used the app on match days. Five of respondents used the app very rarely and four people used it on a weekly basis. Only one respondent replied using the app on a daily basis.

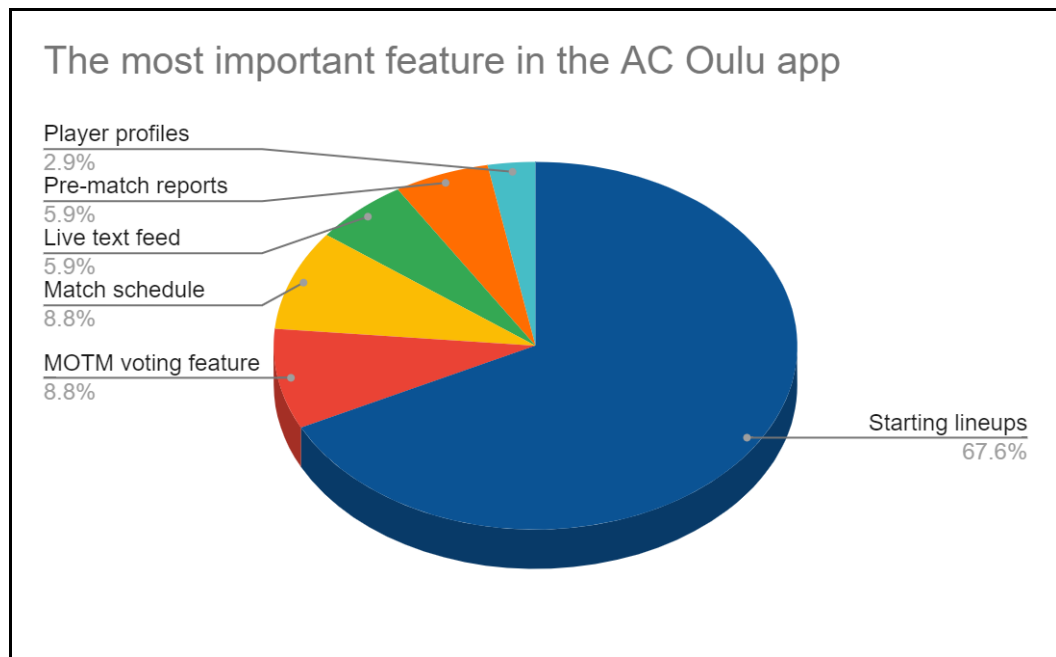


Figure 9. The most important feature in the AC Oulu app.

Real-time live player statistics feature was popular among the respondents. Around 70% respondents ranked the feature to the rating 8-10 (Figure 10). Feature would be unique among the football club apps around the world. No other club in the world provides this data live to its followers. 17,6% (6 of 34) of respondents did not see this feature as very good. They ranked the feature with a rating of 1-5. In the results there is some dispersion among the ratings.

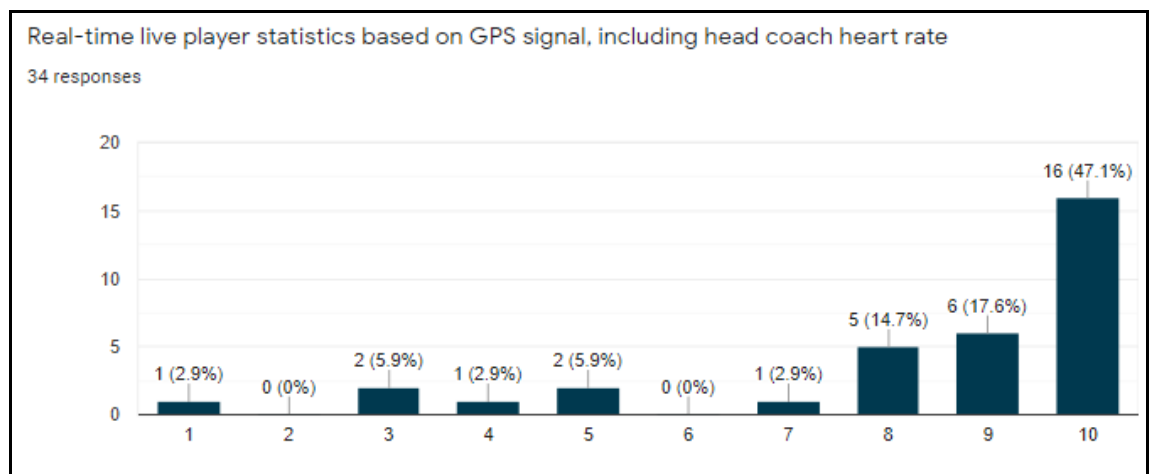


Figure 10. Real-time live player statistics feature.

Figure 11 results show that predicting AC Oulu matches first goal scorer and time is a popular feature. In total 88,3% of respondents ranked this feature with a rating of 8-10. Nobody ranked this feature below the rating 5.

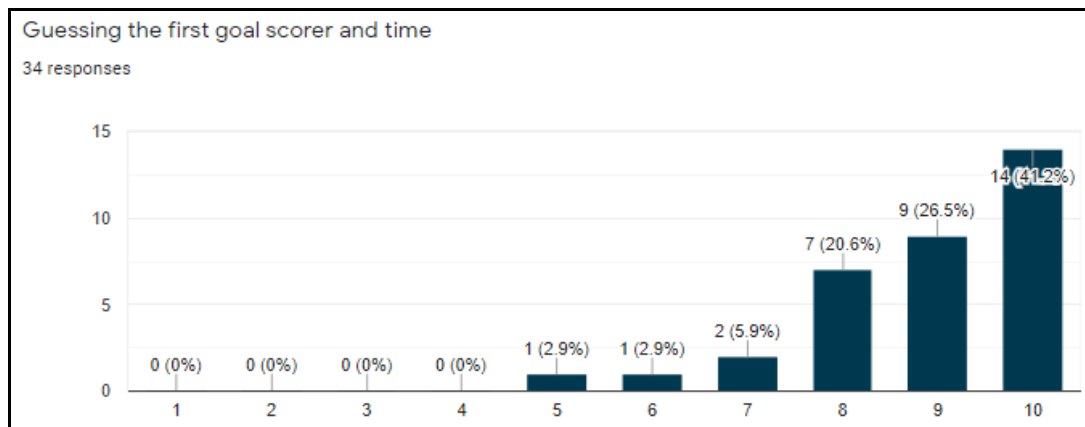


Figure 11. Predicting the first goal scorer feature.

Based on a survey there is demand to have season tickets and match tickets digitally available in the app. Around 85% of respondents ranked the feature to rating 8-10 (Figure 12). The highest percentage 64,7% of survey respondents ranked this feature with 10 rating. Based on all survey results this was the most demanded feature. Same feature was also the most requested in the 2018 AC Oulu Facebook survey (AC Oulu, 2018b).

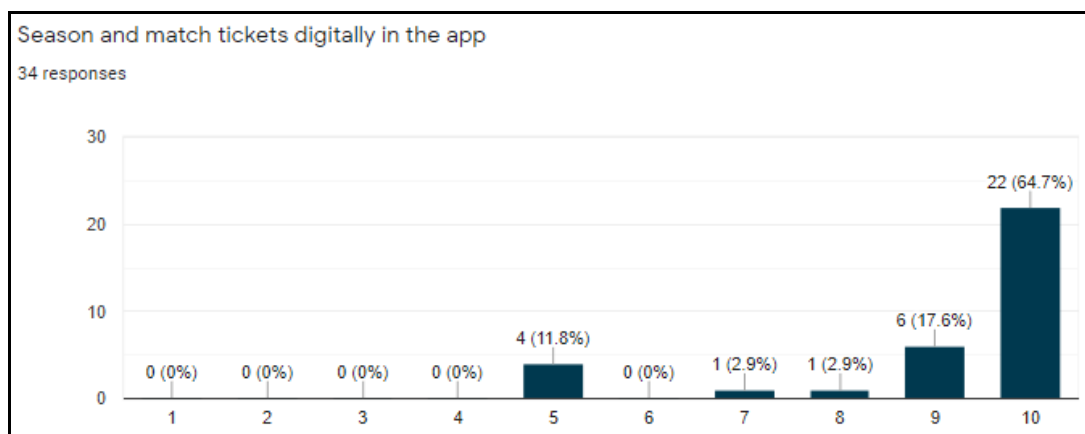


Figure 12. Season tickets and match tickets digitally available in the app feature.

Figure 13 shows the popularity of an advance payment feature in AC Oulu home matches. In total 70,6% have ranked this feature with a rating 8-10. Only 11,7% of respondents did not see this feature as important as they ranked it with 3-5 rating.

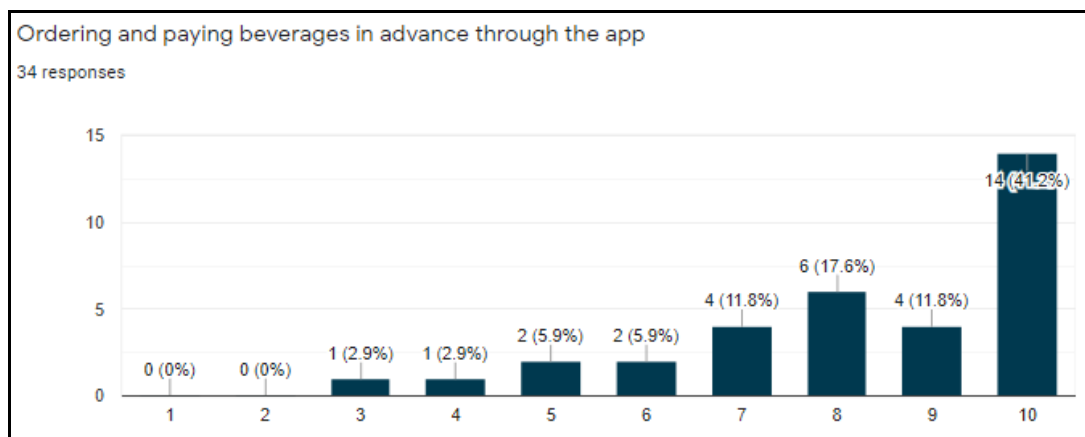


Figure 13. Advance payment feature in AC Oulu home matches feature.

Figure 14 shows that 70,6% of respondents ranked an adjustable push notification feature with a rating 8-10. Only 14,7% of respondents did not see this feature as important and rated it with 3-5 rating.

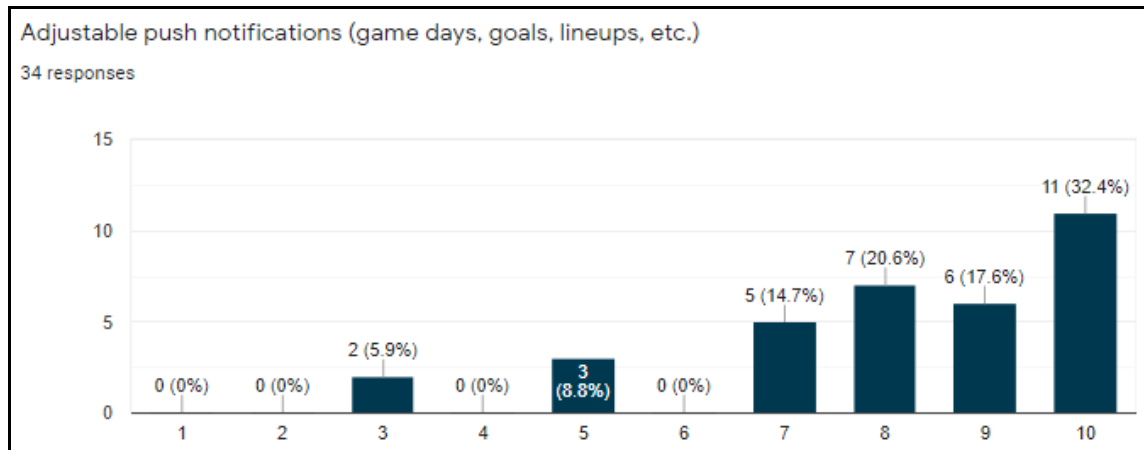


Figure 14. Adjustable push notification feature.

Web survey respondents submitted 8 new development ideas. Table 4 shows details. *I01* suggests rewarding someone by drawing a winner(s) from all MOTM voters after the match. A winner could show their device after the match at the kiosk to claim the prize. *I02* suggests adding push notifications to the app with an addition of promoting supporters away game trips. *I04* suggests adding upcoming matches as push notifications. This could positively affect attendance in AC Oulu home matches as followers are reminded of upcoming matches. *I03* suggests adding referees to live match feeds. This would be easy to implement as a list of referees is available in result service API.

Table 4. Respondents development ideas.

I01	Casting an AC Oulu MOTM vote would give a chance to win some small prize
I02	Push notifications about supporters away trips and ability to enroll to the away trip
I03	Referees and linesmen listed in live match center
I04	Upcoming matches as push notifications
I05	Alarm clock with AC Oulu goal song
I06	Recipe for a famous food portion served in home games
I07	My day players videos to the app
I08	More integrated content to the app. For example, news from AC Oulu website should be opened in the app.

Only 23,5% (8 of 34) respondents submitted their own development idea for the app. Submitted ideas were all small improvements to already existing features. The *I04* idea was already covered in the push notification feature. Codemate and AC Oulu representatives did not find any of these ideas as groundbreaking improvements to the app.

5.5 New features and improvements

Table 5 lists all new feature ideas emerged in this study. The study revealed a total of 20 possible new features. Some of these listed features are already implemented by other clubs in their apps. The most potential development ideas serving AC Oulu have been produced to more detailed conceptual requirements and specifications. *F01*, *F02*, and

F09 were selected as the most potential ones based on a survey and discussions with AC Oulu and Codemate.

Table 5. New feature ideas.

ID	Title and description
F01	Real-time live player statistics Feature is based on wearable sensors on players and the coach. See chapter 5.4.1 for more details.
F02	Predicting the AC Oulu first goal scorer and time Before the match, app users could predict the first AC Oulu goal scorer and time. If someone guesses it right, AC Oulu could reward the user after the match. See chapter 5.4.2 for more details.
F03	Season and match tickets digitally in the app Season and match tickets could be available digitally in the app for registered users. This feature would require registration and user management to the app.
F04	Ordering and paying beverages in advance through the app Increase the app usage. This feature would require a user management system.
F05	Digital wallet for quick payment in home games This feature would require a user management system.
F06	Digital special offers to collaboration companies Increases collaborators visibility in the app. This feature may require a user management system.
F07	Special offers in home games via the app This feature would increase app general usage. The feature may require a user management system.
F08	Fanstore in the app This feature would make purchasing AC Oulu merchandise easier for fans and followers. Requires a user management system.
F09	Adjustable push notifications See chapter 5.4.3 for more details.
F10	Favorite players and voting the best player at the end of the season This feature may require a user management system depending on implementation.
F11	Instagram linked to app with #acoulu tag and AC Oulu account with players public accounts Players' Instagram and Twitter accounts are already linked in the AC Oulu homepage player profiles section.
F12	AC Oulu ACIAA -podcast directly in the app This feature would be easy to implement. The feature works already if the podcast is linked as a news on the homepage.
F13	Quick feedback feature of home matches The feature adds interaction and is quite easy to develop. This feature may require a user management system.
F14	Camera to take pictures and selfies in matches with club themed visual effects (Match score, team logos, etc.)
F15	Search field for specific news This feature would improve general usability of the news section on both the website and in the app.
F16	Information about club staff Coaches and other background staff could be included in the team roster section.
F17	Details about AC Oulu reserve team
F18	League top scorers' statistics The Standing section could display league top scorers as this data is already available in the result service API.
F19	Stadium map including kiosks, parking, ticket sales, seats, and entrances This feature would help new spectators arriving at the AC Oulu home matches.
F20	Betting odds from Veikkaus to match center

Table 6. Small improvements and bugs.


ID	Title and description	Type
A01	Possibility to swipe and tap players back and forward This addon would speed up navigation between the players in the roster	addon
A02	More pictures of each player in match action to player cards Swipe gesture to browse and navigate between different player pictures	addon
A03	Link to Elisa Viihde live matches App could promote the streaming service that provides AC Oulu matches live	addon
A04	There is no direct links to download the app from AC Oulu website (iOS and Android)	addon
A05	Direct links to club merchandise and match tickets sales Quick solution would be to provide links to merchandise and ticket sales websites in the app	addon
A06	Graphical bug in different aspect ratio devices in match center live text feed Devices with screen 19.5:9 aspect ratio do not display content correctly. Example: 	bug
A07	Embedded web elements merged into the app without useless elements See chapter 5.4.4 for more details.	addon
A08	ACOTV as embedded YouTube element to the app YouTube app or browser is launched to show the video.	addon

Table 6 lists all possible small improvements and bug fixes that cannot be identified as entirely new features. *A07* was selected as a more detailed requirement as in the survey there was feedback about opening news directly in the app.

5.5.1 Real-time live player statistics feature

Feature ID *F01* ‘Real-time live player statistics’ would provide live metrics of AC Oulu players’ performance in matches. Feature is based on a wearable tracking system.

The Polar Team Pro system was used as an example in this case. AC Oulu has been using the Polar Team Pro system since 2016 in their coaching (Polar, 2019a). Team Pro sensor provides running speed, distance, sprints, accelerations and running cadence to both outdoors and indoors. Sensor measures players’ heart rate and changes in their heart rate. GPS functionality can provide a location-based heat map. All data is provided by a MEMS (Microelectromechanical systems) motion sensor including accelerometer, gyroscope, and digital compass. (Polar, n.d.)

Table 7. Technical details from Polar Team Pro API (Polar, 2019b).

Name	Type	Description
player_id	string	Player ID
first_name	string	Player first name
last_name	string	Player last name
Field	Type	Description
time	string	Timestamp in string format, starting from 0
speed	double	Current speed
distance	double	Total distance moved in meters
hr	double	Heart rate
lat	double	Latitude coordinate
lon	double	Longitude coordinate
Name	Type (format)	Description
latitude	number	Start latitude of the training session
longitude	number	Start longitude of the training session
start_time	string (date-time)	Start time of the marker
stop_time	string (date-time)	End time of the marker
duration_ms	number	Duration in milliseconds
distance_meters	number	Distance in meters
sprint_counter	integer	Number of sprints
heart_rate_max	integer	Maximum heart rate of the training session
heart_rate_avg	integer	Average heart rate of the training session

Table 7 lists essential data sources from Team Pro API for implementing this *F01* feature. Figure 15 shows a mock-up of one individual player live statistics. Statistics can include total distance travelled, top speed, current speed, number of sprints, average speed, minutes played, and a heat map. Statistics can be synced with match kick-off. Collecting data can be started when the match begins. Players live heart rates would be too sensitive data to be provided to AC Oulu followers. The opposite team could also observe these live statistics and use it as an advantage in their tactics. If some AC Oulu player is very tired the opposite team could take a benefit and try to attack and pressure that side more. AC Oulu head coach would wear the sensor to provide his live heart rate measurement to the app during AC Oulu matches. App could also display the highest and lowest points of the coach heart rate. This data would be interesting for spectators to see how much pressure the coach has in different circumstances during the game.



Figure 15. Layout of individual live player statistics.

5.5.2 Predicting the first goal scorer feature

Feature ID *F02* ‘Predicting the first goal scorer and time’ would add more interaction between user and the app. Feature would allow app users to guess who scores the first AC Oulu goal and on which minute. As the app promotes AC Oulu it would be wise to limit picking the player to just AC Oulu team. This allows a longer time period for users to respond as there is no need to wait for starting line-ups to appear in the app. Feature would allow users to get more excited following the match as they are eager to find out who scores the first AC Oulu goal.

When someone guesses the right goal scorer and the right time or the closest to the right answer, AC Oulu can reward a winner with a small prize after the game. The feature could be implemented without a user management system by requiring winners to display their phones at the stadium kiosk to claim the prize.

5.5.3 Push notifications feature

Feature ID *F09* ‘Adjustable push notifications’ feature would allow sending important messages to app users using devices push notification capabilities. AC Oulu supporters survey had feedback that notifications about upcoming matches would be a nice feature. Supporters development idea ID *I02* suggested that supporters away trips could be promoted as push notifications.

This feature would make informing fans and followers about upcoming matches and news easier. Feature could possibly increase the app usage. Figure 16 displays a mock-up of notifications setup. The first setting defines if a user allows any push notifications. The setting should be off by default as Bellman et al. (2011) defined in their study that users should control what information they receive. As a solution the notifications tab should be opened in the first time app launch by default. Users can adjust these settings by their own preferences. Push notifications of team line-ups would serve fans as line-ups for an upcoming match was selected as the most popular feature in the survey to supporters. Feature would allow users to receive notification almost immediately when

starting line-ups are available. By implementing this feature users do not need to manually check or refresh the app to find out if line-ups are already available.

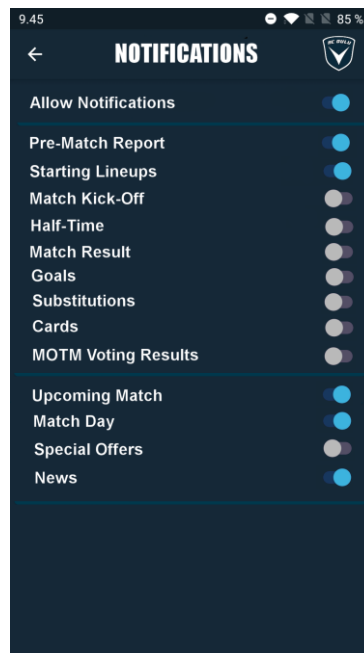


Figure 16. Push notifications.

5.5.4 Hiding useless web elements

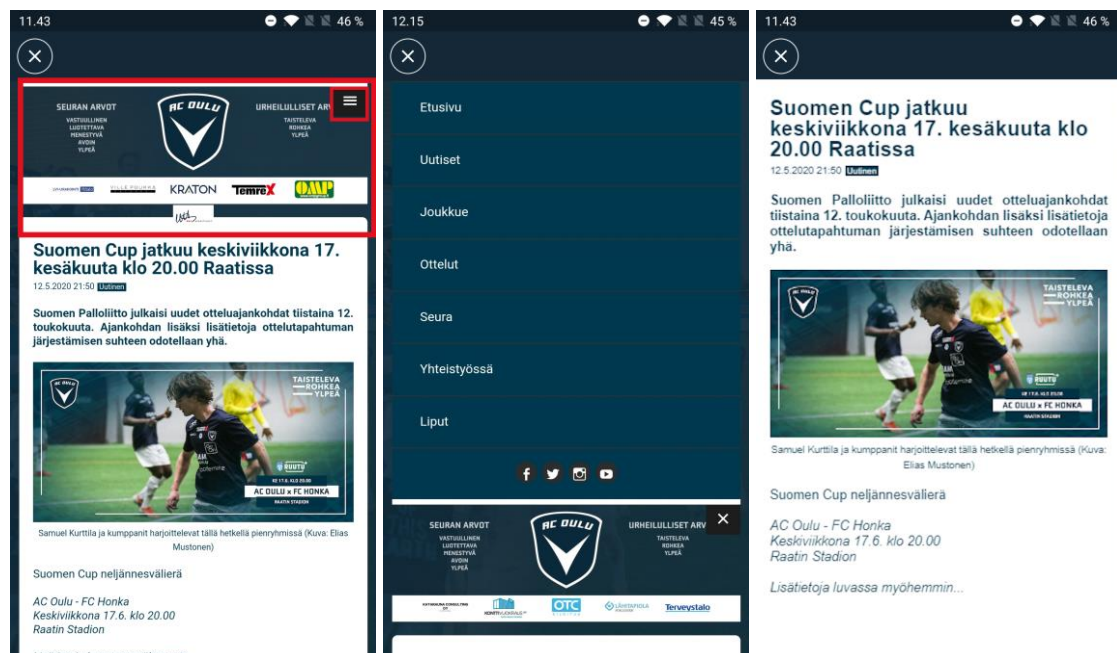


Figure 17. Embedded elements from AC Oulu web merged into the app without useless elements.

ID *A07* task ‘Embedded web elements merged into the app without useless elements’ covers implementing news from AC Oulu homepage seamlessly. The web survey’s development idea ID *I08* suggests implementing homepage related elements more seamlessly to the app. Figure 17 displays on the left how it works now. In the middle confusing website navigation is displayed. On the right figure 17 displays a scenario where useless web elements have been stripped down.

5.6 The results reflecting research questions

The findings in this study reflect defined research questions. The main research question was following: *How to improve AC Oulu app as a service to create more value for the club and their fans?* Based on the comparison, interviews, and survey results the app can be improved by adding new features that increase the interaction, user experience, the usage, and the communication. Interaction can be increased with *F01 Live player statistics feature* and *F02 Possibility to predict the first AC Oulu goal scorer*. Both features were also popular in the web survey. There are a few minor tweaks to improve general user experience. Mainly the small improvements listed in the table 6 (p. 41). *F03 Digital tickets in the app* would make the app more relevant digital service and increase the usage in match events. AC Oulu CEO's vision was that spectators launch the app when arriving to the match. Similarly features *F01* and *F02* would increase the usage in match events. The survey also suggests that the app is used mainly on match days. Communication in this case covers the app promoting upcoming match events (*F09*) and a possibility to give quick feedback of the last match event (*F13*). In the survey, respondents requested reminder push notifications of upcoming matches. Quick feedback option would create an official channel to give match event feedback.

The second research question was following: *Which new app features can increase the amount of people attending AC Oulu match events?* The conclusion was that the app could make AC Oulu followers more aware when AC Oulu is playing their home matches. *F09* Push notifications feature would allow app users to be reminded of upcoming matches. Over 85% of supporters ranked push notifications as an important app feature in the web survey. *F03* feature would bring ticketing in the app and simplify purchasing process. This could affect participation decision positively. Similarly, stadium and parking instructions with *F19* feature can help new customers arriving to the match.

5.7 Summary

To summarize the research findings, football club mobile apps all have similar basic features. There is not much diversity in the content. Instead the quality of features implementation varies a lot across the apps. Common problem in many apps was using the club's website as an interface for selected features. Usually this kind of implementation makes the user experience very poor. The club apps in general are lacking interactive elements and user input.

The AC Oulu app fulfills all basic characteristics of a football club app. Features included in the app are implemented with high quality. The app provides good user experience and is intuitive to use. Flutter as SDK fits well for both Codemate and AC Oulu needs. Cross-platform framework provides easy maintenance and development possibilities. The app is constantly developed further to match AC Oulu fans and followers needs.

The study was able to identify a total of 20 new feature ideas and 8 small improvements to the app. The most demanded new feature in AC Oulu supporters web survey was providing a season and match tickets digitally in the app. Real-time live player statistics, the possibility to predict AC Oulu first goal scorer, and adjustable push notifications were also popular. The respondents mainly use the app on match days. The most important feature in the 2.0 version of the app was providing teams' starting line-ups in advance. Based on all the findings, three most potential new feature ideas were processed to conceptual specifications and design mock-ups.

6. Discussion

This thesis has focused on how to improve the AC Oulu mobile app as a service to create more value for team's fans and followers. The aim in this chapter is to discuss the research questions and the findings. This is achieved by comparing previous literature to results of this study.

6.1 Discussion

Official football apps are designed primarily to the club fans (Other Media, n.d.). Apps rarely offer anything new that is not available in the club's social media channels or official websites. Universally all club apps in different sports provide similar content and features with football club apps. AC Oulu app matches common official club characteristics. The AC Oulu app provides all key functionalities that are typical to official club apps. The layout and colors suit AC Oulu brand and design schemas on their other digital channels. The focus in the app development has been to provide more unique features such as AC Oulu MOTM voting and advent calendar. The MOTM voting feature and providing team starting line-ups in advance increases the app usage on match days. The app functions as a digital match brochure and have replaced the paper version in AC Oulu match events. The app gathers everything happening around the club. In Finland, official club apps mainly target local club fans and people attending the matches. There is a difference compared to big clubs in Europe who target a wider audience from all over the world.

Watkins and Lewis (2014) study stated that club apps very rarely promote their star players. Top players and club success could be promoted more aggressively in the app. Pictures of the top players could be utilized as background images or embedded to the general layout. One reason that promoting their star players is not popular could be that players can switch clubs quite frequently. After a player leaves the club design layout needs to be updated and that again adds maintenance work.

As a rival interpretation, can a responsive club website offer the same functionalities as an official app? One key notice from the world's most popular league English Premier League 19/20 season is that Bournemouth, Leicester, Newcastle and Southampton do not have an official club app. This group of clubs covers 20% of the Premier League. These clubs have focused on making their websites as mobile friendly as possible. As a summary there are many top tier clubs that do not have an official mobile app. These clubs try to offer the same services through their homepage by providing a responsive interface to different mobile devices. Web based solutions have developed so far that almost everything that can be provided with native mobile app can be provided in a web app (Majchrzak et al., 2018). The problem in web apps is the marketing. Special functionalities on a club website is much harder to market compared to having a mobile app available in an app store. Clubs need to decide if they see enough value to invest financial resources to develop a club app. When a club app is released maintenance and online services still need financial resources to keep them running. Club fans typically have expectations that the app is developed further after its initial release. If development is on hold, in the long run it will affect the number of app users negatively. Based on app comparison, football clubs in Finland do not invest in developing their club apps further. HJK's Klubilainen app is a good example of a dying club app. App's

development has been on hold since 2018. The app does not function properly anymore as some of the background services are already taken down. In May 2020 Klubilainen app is no longer available on app stores because of these problems. Similarly, Seinäjoen Jalkapallokerho (SJK) had an official club app available earlier which has also been taken down by now.

Top tier clubs that do not have an official club app allow new business opportunities for software companies to market their solutions. In Finland, having an official club app provides novelty value. Only a handful of football clubs have released their own branded apps. From a user perspective, installing the app from the app store is an easier procedure compared to accessing similar service with a mobile device browser. On the other hand, website based solutions do not need users to install and update “the web app” similarly compared to club apps. Mobile apps allow clubs to create a direct access point to users' mobile device (Ha et al., 2015). Opening the specific app and installing it to the phone indicates that the user wants to use the app. Native applications allow utilizing devices built-in functionalities including camera and GPS more efficiently compared to traditional websites.

Many major football leagues provide a league specific mobile application. League apps deliver similar live information as individual club apps with a wider perspective covering all league teams. Two of the highest football leagues in Finland do not have their own tailored mobile applications. Official club apps are also in indirect competition with general sport or football apps that provide live score and live text feed data. Veikkausliiga as a Finnish top football league could be a potential customer for a club app concept similarly the Finnish ice hockey league provides individual apps for each team. Ice hockey league also has its own league app (Liiga). Similar club app would serve the Finnish national football team. The Finnish national team does not have its own app. As Finnish football national team qualified for the Euro 2020 tournament there is a huge hype around the team. This hype creates a demand for the Huuhkajat (Nickname of the Finnish national team) app. The COVID-19 epidemic caused the Euro 2020 tournament to be postponed to summer 2021 (UEFA, 2020). This delay creates a wider time window to launch such an app. The app could provide the Finnish FA to inform their travelling fans through the app. UEFA more widely provides their own application for the tournament. Huuhkajat app would serve as a great information channel for the other national team matches including qualification, UEFA Nations League and friendly matches.

The focus in the AC Oulu app development has been to provide information that is not available in other channels as easily. These particular features are starting line-ups in advance, MOTM voting, and advent calendar. Listed features are popular among the app users. Supporters web survey backs this as 67.6% of respondents chose starting line-ups as the most important feature in the app. Starting line-ups are earlier available in the app compared to club's Twitter and Instagram accounts where line-ups are revealed later. The popularity of starting line-ups can be explained with 70,6% (24 of 34) using the app on match days. Enthusiastic fans see starting line-ups from both teams as an important factor in how the teams are playing against each other. Line-ups reveal if important players are injured or suspended. Starting line-ups give a good topic for conversations and speculation among the fans before match kick-off. Another factor is that line-ups are easily available in the app compared to Finnish FA result service which is not intuitive to use and incoherent. Finding the specific data from the result service is not easy. Line-ups in the AC Oulu app are available earlier compared to third-party results services such as Livescore.com and others.

82.4% (28 of 34) of survey respondents did not use any other official club mobile apps. 17.6% respondents used the Oulun Kärpät app, that is a local ice hockey team app. The

reason for this can be that fanatic fans only follow their favorite team. Oulun Kärpät app in the Play store has over 10 000 installs compared to AC Oulu app over 500 installs in Google Play store.

6.2 Answers to the research questions

- RQ1. How to improve AC Oulu app as a service to create more value for the club and their fans?

The app can be improved by adding new features that create more value for customers. New feature ideas were selected and conceptualized further with additional value as a target. As Davis (2017) stated that club apps are the most frequently used on match days functionalities centralizing match events should be developed further. The app to be successful, the fans should be lured to use the club app outside the match days. Based on survey results 70,6% of AC Oulu supporters use the app only on match days.

Many of the suggested new features in this study would require adding the registration and user management to the app. 10 out of 20 suggested new feature ideas might require adding a user management system to the app depending on implementation strategies. Implementing user management would make the app structure more complex and increase required maintenance work. Optional registration feature would add an extra step to quick download, install and run the app procedure. User management would allow AC Oulu to profile their app user base. Registration was a common feature across the compared club apps. 90% of club apps had the possibility to register.

Davis (2017) study suggests that an official club app should offer something different compared to the club's other channels. Fans should be happy to use the app to continue using the app (Ha et al., 2015). One key feature would be providing fans to buy match tickets easily in the app. Currently the AC Oulu app does not have any link to the ticket portal. As tickets are sold by a third-party company, users are required to register or deliver their personal details to this third-party system. The most convenient solution for fans would be that app users could buy the tickets directly from the app without redirecting users to the outsourced ticket portal. The app would allow users to store season and match tickets in the app. When entering the match digital tickets would be scanned at the stadium gates from a user mobile device. In theory, if the entire ticketing system is run by the club there is no need to pay royalties to the ticket service. Developing and implementing an entire ticket system to the app is an enormous task. For this reason, it is important to consider all factors before implementing such a feature. A ticketing feature would add general maintenance and support work. Another possibility is to implement the system in collaboration with a ticket company. Developing such a complete solution that includes the entire ticketing system could open new marketing opportunities as a service provider. The complete solution concept could be marketed to other football and sports clubs better. For the fans integrating ticketing seamlessly to the app would be a huge attraction. Based on answers over 88% of supporters survey respondents demanded digital season tickets and match tickets to the app.

In the results this thesis has focused on providing details of the features that will deliver to the fans more unique user experiences not available elsewhere. Real-time live player statistics and predicting the first goal scorer features were selected to be processed into more detailed specifications. These features would provide unique characteristics that are not available in any of the other tested club apps. Dellea et al. (2016) study predicted that club apps in the future will deliver players performance data in real time.

One additional improvement could be to display overall rankings of voted AC Oulu MOTM players. This kind of statistic would be relatively easy to implement as individual player votes are already calculated. Adding integration to Instagram with #acoulu hashtag would allow fan posted pictures to appear in the app information feed. Similarly match specific hashtags from Instagram could be shared in the match specific information feed.

- RQ2. Which new app features can increase the amount of people attending AC Oulu match events?

Full stadium creates a better atmosphere for a football match. In sold out matches, the club gets more revenue from ticketing, merchandise, and kiosk sales. Key to achieve this goal via the app is to make AC Oulu followers more aware when AC Oulu is playing their home matches. The problem is that Finnish first division match days vary a lot. Fans cannot automatically presume that AC Oulu is playing their next home match on next Saturday. Starting times of the matches also vary. F09 Push notifications feature would allow app users to be reminded of upcoming matches. An app user could configure notifications based on their own preferences. Over 85% of supporters ranked push notifications as an important app feature in the web survey. As the user launches the AC Oulu app, the next match is already displayed on the home screen. So, in a way the app already promotes upcoming AC Oulu matches to users who have launched the app from their devices. Via the push notifications AC Oulu could promote upcoming important matches that would be more interesting for a casual team follower. The app could promote AC Oulu playing against a top team or match against the same level team of important points. A push notification function allows promoting events directly to followers who have installed the app. In the other social media channels a match event promotion can get lost in large quantities of posts from content creators. Promoting an upcoming match event through push notifications is free compared to an advertisement in a local newspaper or on roadside digital billboards. Especially important upcoming matches could be promoted more heavily in the app using both push notifications and the app home screen.

For a push notification option to be successful the app needs to be installed on as many AC Oulu followers' mobile devices as possible. Also, the specific push notification selection needs to be enabled in the settings. In order to increase the number of installs, AC Oulu could promote the app by announcing a one-time special offer from the stadium speakers in a match event. This special offer could be claimed by showing the phone on half time at stadium kiosks. The promotion campaign could include an AC Oulu collaborator company to offer their products through this event. As an example, on a hot summer day spectators with the AC Oulu app installed on their devices could receive a free ice cream.

Dellea et al. (2016) defined in their study that ticketing has become almost entirely a digital process. An ability to buy tickets directly and easily straight from the app could reduce the barrier to buy the tickets and participate in AC Oulu match events. One major flaw in the AC Oulu app is missing a link where to buy tickets to upcoming matches. 75% of football club apps included in comparison provided a link to buy tickets. The AC Oulu app requires users to find this information themselves from the AC Oulu website. AC Oulu followers installing the app might assume that the app allows them to buy tickets or at least provides a link to the ticket portal.

Real-time live player statistics as a unique feature can affect people attending matches positively. Similarly predicting the AC Oulu first goal scorer feature adds a new interaction element to the match events. By providing a special offer to a match event for app users can affect app users' decision to participate in the upcoming event.

Ordering and paying beverages in advance through the app could also lure new customers to participate in the match events. Especially if payment via the app is cheaper compared to other payment methods. For new spectators, a stadium map including kiosks, parking, ticket sales, seats, and entrances in the app can also affect participation decisions positively. Team success and performance on field is still the most important factor affecting high attendance in AC Oulu home matches. Based on poor results in 2019, spectators' attendance in home match events decreased drastically throughout the season (AC Oulu Kannattajat, 2019). The app can be used to promote upcoming match events more efficiently and have positive effects to overall attendance. Still other factors play bigger role in a successful match event.

6.3 The app from different perspectives

The club app is explored from different perspectives including a club, a follower, a service provider, and a collaborator perspective.

Table 8. Important factors from different perspectives.

Club perspective:	Follower perspective:
<ul style="list-style-type: none"> • Solution cost • Complete solution • Interaction with fans • Providing data that covers fans needs • Marketing and promotion • Integrated to existing systems with automation • Easy maintainability • Brand recognition • E-commerce 	<ul style="list-style-type: none"> • Easy to use • Innovative UI • Content • Interaction • Something new not available elsewhere • Everything related to the club collected under one app
Service provider perspective:	Collaborator perspective:
<ul style="list-style-type: none"> • Native application for all platforms (Android/iOS) • Integration to existing systems and automation • Easy to develop • Easy to maintain • Commercial success • Development and maintenance resources need 	<ul style="list-style-type: none"> • More visibility through the app • Increase sales • Special offers for app users

The solution cost is a key element guiding decisions on how to implement an official app for a football club. Especially in Finland, clubs have limited financial resources to invest in app development. A club needs to decide if an app provides enough real value to cover the costs. For a small football club, launching its own mobile app is not necessarily wise. Developing and maintenance costs can exceed the benefits.

Clubs desire a complete solution that provides interactive elements for club fans and followers. Content wise, the app should fulfill fans' needs. The app should provide new marketing and promotion elements for a club to increase sponsors and collaborators visibility through the app. The app should enhance the club's brand recognition. It is important that the app has high-quality features and content. A poorly created app can affect the club brand negatively. E-commerce in the app is an important element as it provides revenue streams for the club. E-commerce can cover fanstore, ticketing, and

digital sales in match events. E-commerce can be implemented by integrating already existing services to the app or as standalone feature.

The app should utilize existing digital systems by integrating seamlessly to these services. Integration can cover club news, match highlights, a result service, statistics, fanstore, and ticketing. The data in the app should be easily maintainable including as much automation in the processes as possible. Required manual work in maintenance should be minimal. Interfaces for manual maintenance work should be easy to use. The registration and user management properties increase the amount of required maintenance work quite drastically.

From a follower perspective, the app should be easy to use and have an innovative UI. The features and the content should provide wow experiences for followers. The content in the app should serve followers' and their needs. The app needs to provide something special that is only available in the official club app to maximize the number of active users. Features providing interactive elements can increase the app usage rate. Generally, the app should provide everything happening around the club as a package.

The framework and technology used to implement is an important factor from a service provider perspective. A service provider selects the used framework based on their expertise. The framework should provide native application elements for both Android and iOS platforms. If the framework supports both platforms, just one source code needs to be developed. This is an important advantage compared to developing the app separately to both platforms. Cross-platform framework saves up resources needed for development. Cross-platform frameworks have an advantage where design changes to new releases can be implemented more easily compared to native frameworks. The maintenance routines are easier on cross-platform apps. Important factor when selecting a framework version updates should not require a lot of design changes to keep maintenance routines simple. The club app should be integrated to existing systems to keep data intact in all services. The outcome is that there is only a need to update specific information to just one location. The number of different interactions define the amount of maintenance work. Typically changes in APIs and interactions routines can cause problems and require design changes to the app source code. All these factors define resources needed for app development and maintenance. Commercial success is an important factor for service providers. A successful official club app can be marketed as a concept to other sports clubs. Club sponsors and collaborators can get more visibility through the app based on its features. An official club app can provide possibilities to collaborators to market their products through the app.

All factors discussed in this subchapter have been taken quite well into account in the AC Oulu app development and releases. The AC Oulu app includes all basic features required for a successful club app. The additional new features investigated in this research will make the app even better and provide more value for AC Oulu followers and the club community.

7. Conclusions

This chapter summarizes the research results and the entire study. Research limitations and possible future research are also presented in this chapter. Comparison of official football club apps proves how similar different football club apps are in general. It does not matter if the app is designed for a small club in Finland or some top tier club from English Premier League. Overall club apps have the same basic features. Majority of the tested apps provided the same basic functionalities including: team news, match reports, match schedule, team roster, league standings, fanstore, registration option, and push notifications. Club app content is similar across all different sports. Major differences between football apps were how well these features were implemented. Hastily created apps and specific features affected general user experience negatively. For research validity, the AC Oulu app was investigated from four different perspectives including: the club, service provider, a follower and a collaborator. A web survey for app users was conducted to support research findings and collect user opinions of new feature ideas. The AC Oulu app and football apps in general were studied extensively to reach the highest quality research.

For football clubs operating with limited financial resources the solution cost is a key element guiding decisions on how to implement an official app. A club app should provide enough real value to cover the costs. A poorly designed app can negatively affect the club brand. Primarily the app functions as a new marketing channel for the club. The app promotes the club as a product to followers.

This research demonstrates that a cross-platform based club app is an optimal selection for AC Oulu. Flutter as SDK provides a framework to easily develop and maintain the entire service. Flutter framework allows comfortably implementing new app features for both iOS and Android platforms. Cross-platform framework saves up resources needed for app development. Club fans expect the app to be developed further after its initial release. An official club app should always primarily serve club fans and followers. The app should be designed based on their needs. Scale of implemented features should be extensive enough to fulfill every club follower needs. In the AC Oulu app, the MOTM voting feature and providing team starting line-ups in advance increases the app usage on match days. The AC Oulu app functions as a digital match brochure in match events.

There are still many top tier football clubs that do not have an official mobile app. Clubs without a mobile app solution have focused on making their websites more mobile friendly. The problem in a web app-based solution is how to market it to club followers. Special functionalities on a club website are much harder to market to consumers compared to having a mobile app available in an app store. In a hybrid solution, a club app can utilize existing components from the club website. Especially in Finland club apps provide novelty value as only a handful of football clubs have released their own app.

Football club apps rarely offer anything new that is not available in other club's social media channels or their official website. For this reason, it is important the club app offers something different and unique compared to the club's other channels. Club apps are the most frequently used on match days, so functionalities centralizing match events are important.

This research focused on answering the following question. *How to improve AC Oulu app as a service to create more value for the club and their fans?* This thesis provided general design mock-ups for following new features. Real time live player statistics feature would deliver unique live metrics data from players and the coach. Second feature was the ability to predict the AC Oulu first goal scorer before the match kick-off. These two features would provide unique characteristics that are not available in any of the other tested club apps.

The second supportive research question was *Which new app features can increase the amount of people attending AC Oulu match events?* Key to achieve this goal is to make AC Oulu followers more aware when AC Oulu is playing their home matches. Common feature among club apps that the AC Oulu app is missing is the push notifications feature. The feature would allow sending push notifications and reminders of upcoming matches to app users' smartphones. To achieve this the app needs to be installed on as many AC Oulu followers' mobile devices as possible. Another important feature missing is the ability to buy match tickets from the app. Ticketing has become almost entirely a digital process. Having season tickets available digitally in the app and ability to buy match tickets through the app was one of the most requested features in the AC Oulu supporters web survey.

This study was quite broad and covered the AC Oulu app from many different perspectives. The subject was studied extensively to ensure the authenticity of research and reliable results. Possibly study could have focused more in some specific area of the subject. Another limitation was that a web survey could have targeted a wider AC Oulu follower base. One of the reasons the survey audience was limited to a smaller sample group was to avoid planting excessive expectations that all ideas will be implemented to the app in the future. AC Oulu can inquire spectators and followers on how the app could be improved in their yearly season feedback survey. Other sports apps could have been studied more extensively. This research mainly focused on football club apps. Ice hockey team apps were covered briefly in comparison. Popular team sports such as basketball, volleyball and American football club apps could have been included in comparison.

For future research, more detailed comparison of each common feature user experience could provide better results on how well each feature is implemented on different club apps. Possible future research could focus on how newly implemented features have affected the AC Oulu club app usage. Study could be done as a feedback survey of new features. This study did not include observation in data collection. Can the AC Oulu app be improved somehow by observing the fans and followers using the app? More user-centered view could provide a better understanding of the app user experience and how the experience could be improved. As an example, has the app affected app users' participation in the AC Oulu match events?

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Appendix A. Questions to AC Oulu

Q01 Can you describe the origins of AC Oulu app?

- *Why was it originally created?*
- *What was the original purpose of the app and has the purpose changed over the years?*

Q02 What is the app relation to the club's other social media channels?

- *Instagram, Facebook, Twitter, homepage*

Q03 How much have you influenced the app content?

- *Has the brainstorming of new feature ideas been more Codemate responsibility?*
- *Have AC Oulu influenced the development of some specific features?*

Q04 What is the most important feature in the app?

Q05 Have you tested other football club apps? In Finland or elsewhere?

- *In Finland following clubs have an app: HJK, TPS, Musa, FC Jazz, VPS, Ilves, (SJK app is not available anymore)*
- *Opinions about those?*
- *How do you see the AC Oulu app compares to other club apps in Finland or abroad?*

Q06 What is the target audience of the app?

Q07 What is the current status of the app??

Q08 What age group is the app target audience?

Q09 How many active users the app has?

Q10 Any feedback from the users about the app?

Q11 How does the app work as a marketing channel for collaborators?

Q12 Any new feature ideas for the app?

Q13 Give us feedback on these new feature ideas?

- **GPS-based Athlete Tracking System data visualized live to fan via the app (i.e. Polar Team Pro)**
- **Possibility to guess a scorer and time for first goal after line-ups are available in the application**
- **Direct links to club merchandise and match tickets sales (currently missing)**
- **Match event feedback feature**
- **Match ticket or season ticket available in application**
- **Payment in match event**
- **Ordering food and beverages to your seat / kiosk**
- **Adjustable push notifications (goals, line-ups, etc.)**
- **Favorite player**
- **Voting feature for player of the season at the end of the season**
- **Information about club staff (Coaches etc.)**
- **Details about AC Oulu Akatemia reserve team**
- **Special offers based on GPS location (if app user is in the stadium around the match)**
- **Search field for specific news**
- **Possibility to swipe and tap players back and forward in player cards**
- **Link to Elisa Viihde live matches**
- **Quiz about club history and facts**
- **Ability to listen AC Oulu podcasts through the app**

Q14 Any future plans for the app?

- *Are there new upcoming features?*
- *Any wishes how the app is developed in the future?*
- *How much can the club financially support the app development?*
- *Codemate resources to develop the app?*

Q15 Is the club interested to profile and collect user statistics of the app usage?

- *Who is using the app?*
- *How much time each user actively uses the app*
- *The most popular features in the app*

Q16 Any ideas to adapt mobile device functionalities better in the app?

- *Camera, GPS location, NFC, microphone*

Q17 Should someone else from the club side be interviewed regarding this study?

Q18 Any questions regarding this study?

Appendix B. Questions to Codemate

Q01 Can you describe the origins of AC Oulu app?

Q02 What is the most important feature in the app from a service provider perspective?

Q03 Can you tell details about collaboration with the club?

Q04 Who are behind the new development ideas?

Q05 Have you tested other football club apps? In Finland or elsewhere?

- *In Finland following clubs have an app: HJK, TPS, Musa, FC Jazz, VPS, Ilves, (SJK app is not available anymore)*
- *Opinions about those?*
- *How do you see the AC Oulu app compares to other club apps in Finland or abroad?*

Q06 Current status of the app from Codemate perspective?

- *Also lead developer's opinion*

Q07 Which integrations exist in the app?

Q08 How is Flutter as an SDK for the app?

Q09 Is the app easy to maintain?

- *As an example, adding and removing players from the player database, advent calendar?*
- *Any problems with existing integrations?*

Q10 How is the MOTM voting timed with the match?

Q11 What is the number of active app users and average match votes per game?

- *Number of downloads from app stores?*
- *How many MOTM votes in home and away games is submitted?*
- *Are users currently profiled in any way?*

Q12 Any feedback from the users about the app?

Q13 Possible commercial potential to market the app concept to other football clubs?

- *Would it be easy to modify the app to other clubs playing in Finnish top two divisions?*

Q14 The future of the app?

- *Challenges in the app development?*

Q15 What are the resources to develop the app?

Q16 How do you see the app as an advertisement of Codemate's know-how?

- *Has the app created new customer relations?*

Q17 Any new feature ideas for the app development?

Q18 Feedback of these feature ideas?

- **Match ticket or season ticket available in application**
AC Oulu had an idea that season tickets could be borrowed digitally in the app to other users. Idea could serve collaborator companies with multiple season tickets for their employees.
- **Ordering food and beverages to kiosk**
- **Payment in match event**
- **GPS-based Athlete Tracking System data visualized live to fan via the app (i.e. Polar Team Pro)**
- **Possibility to guess a scorer and time for first goal after line-ups are available in the application**
- **Direct links to club merchandise and match tickets sales (currently missing)**
- **Adjustable push notifications (goals, line-ups, etc.)**
- **Favorite player & Voting feature for player of the season at the end of the season**
- **Information about club staff (Coaches etc.)**
- **Special offers based on GPS location (if app user is in the stadium around the match)**
- **Search field for specific news**
- **Possibility to swipe and tap players back and forward in player cards**
- **Instagram integration with #acoulu tag**
- **Quiz about club history and facts**
- **AC Oulu ACIAA podcast to app**

Ideas from AC Oulu:

- **Videos in apps could open in the same app instead of user's phone reference app**
- **Digital coupons to sponsor companies**

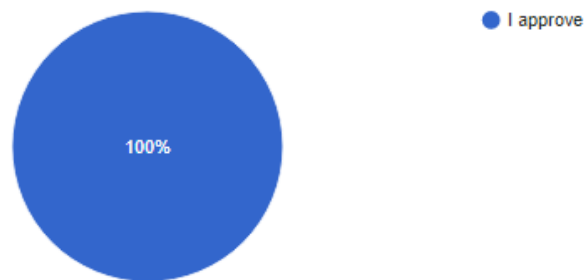
Q19 Opinion about a feature idea web survey to ACO supporters?

Q20 Any questions regarding this study?

Appendix C. AC Oulu survey results

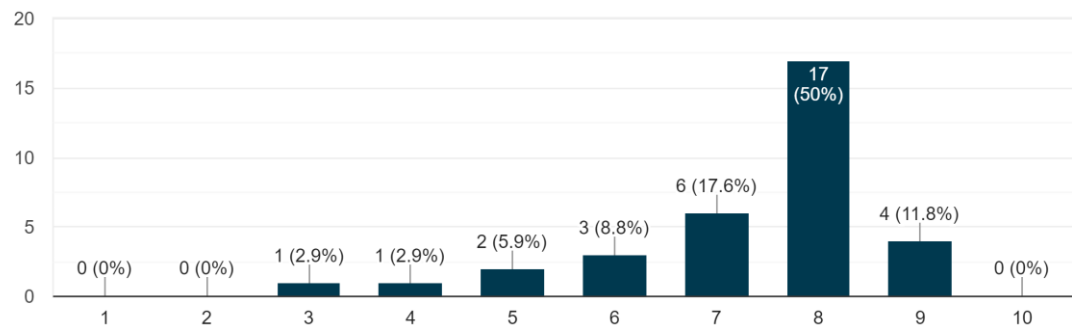
1. I approve development survey terms and allow the usage of my answers in the app development research

34 responses



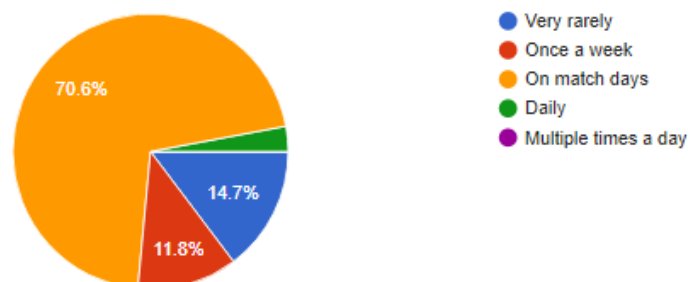
2. How happy are you with the current AC Oulu app?

34 responses



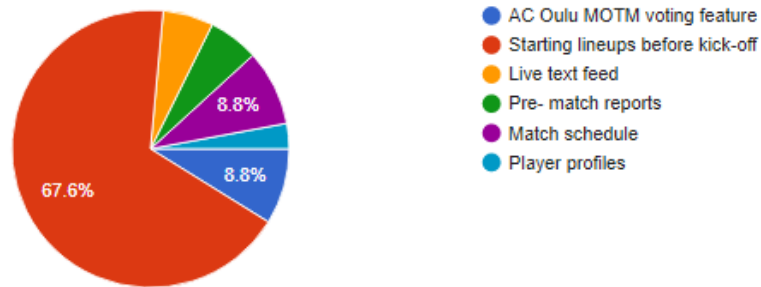
3. How actively do you use the AC Oulu app?

34 responses



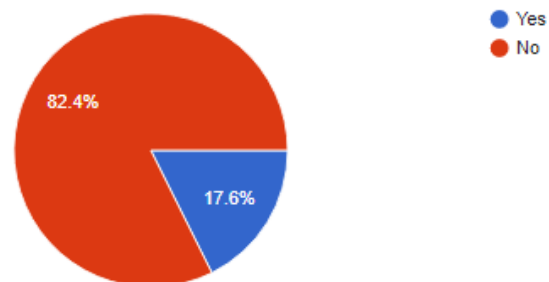
4. What is the most important feature in the app?

34 responses



5. Do you use other official club apps?

34 responses

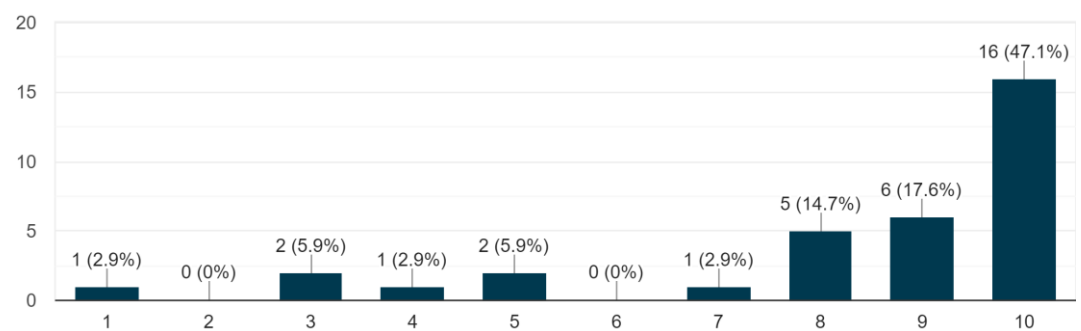


Yes answered (6) Used the app of local ice-hockey team Oulun Kärpät.

6. New development ideas:

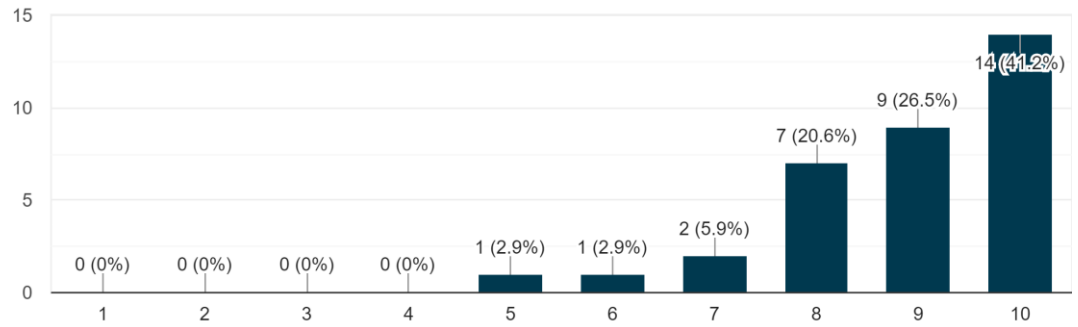
Real-time live player statistics based on GPS signal, including head coach heart rate

34 responses



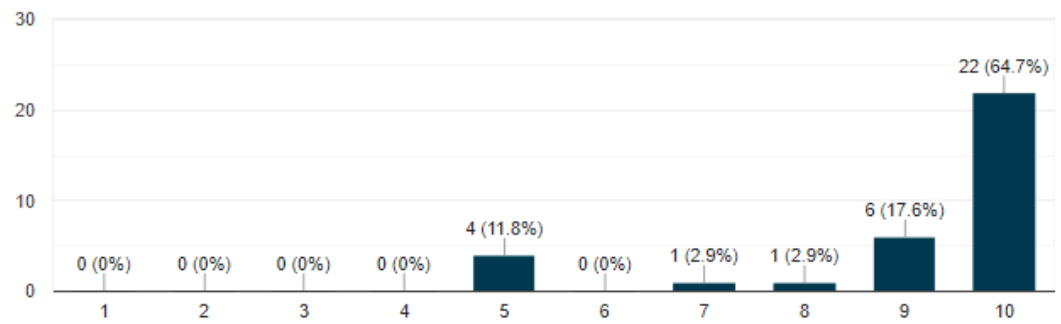
Guessing the first goal scorer and time

34 responses



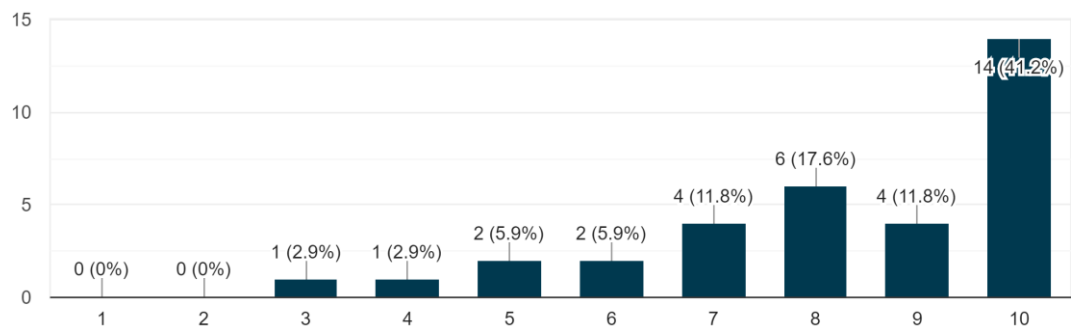
Season and match tickets digitally in the app

34 responses



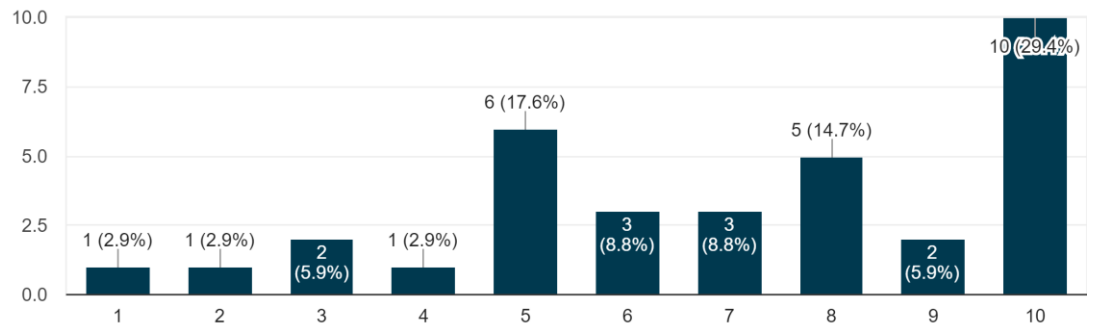
Ordering and paying beverages in advance through the app

34 responses



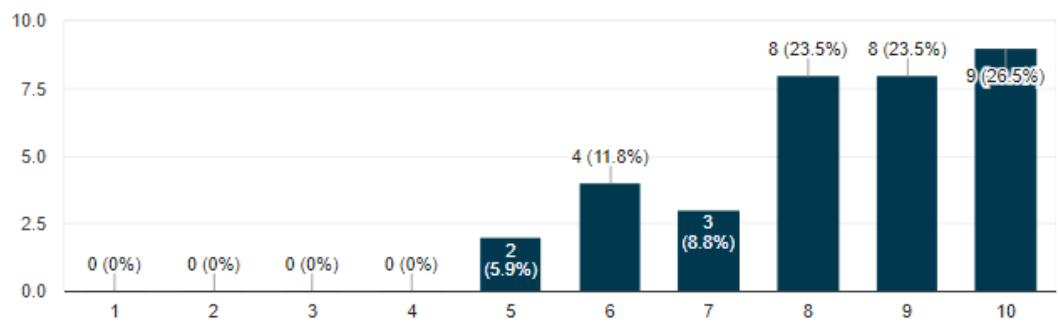
Digital wallet for quick payment in home games

34 responses



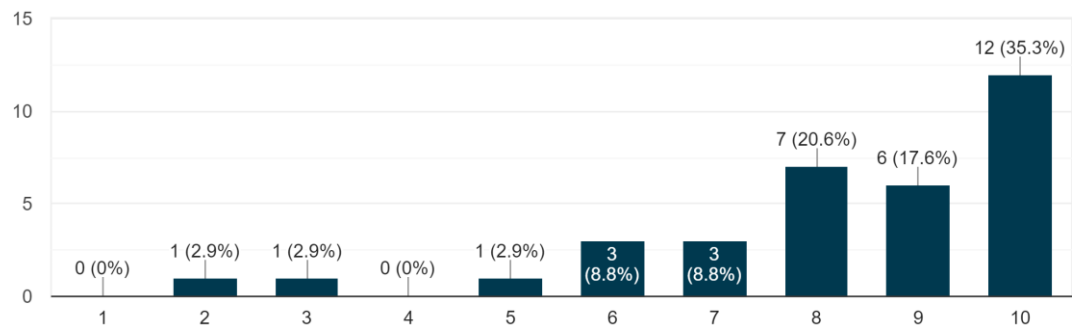
Digital special offers to collaboration companies

34 responses



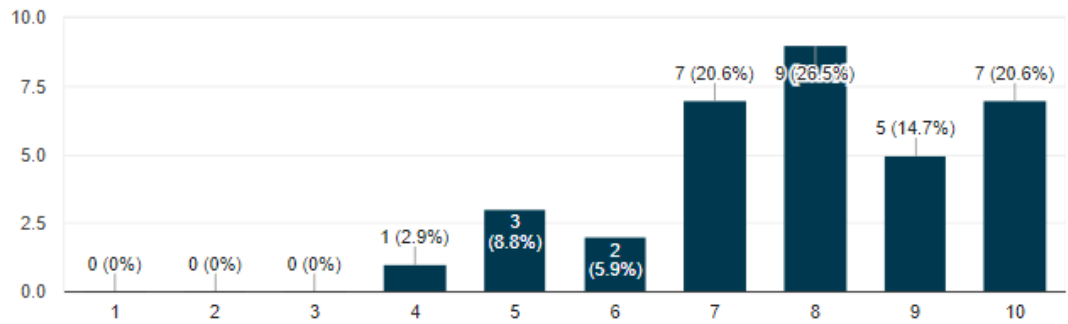
Special offers in home games via the app

34 responses



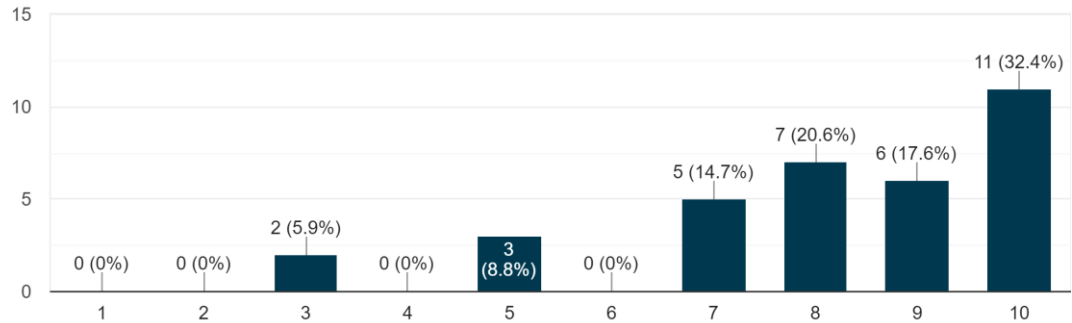
Fanstore in the app

34 responses



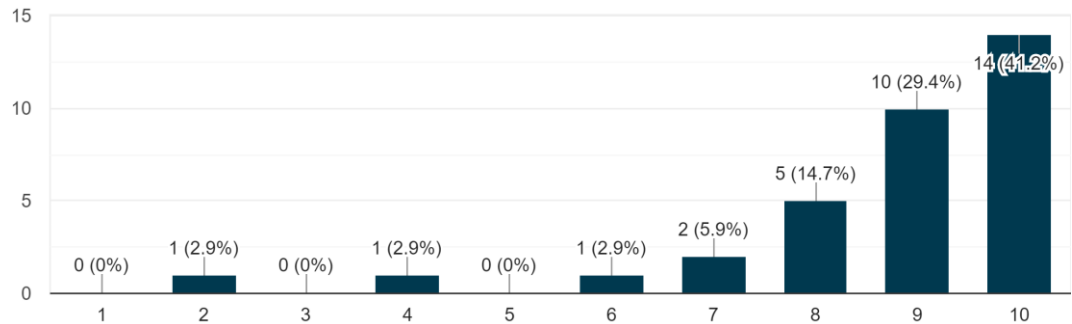
Adjustable push notifications (game days, goals, lineups, etc.)

34 responses



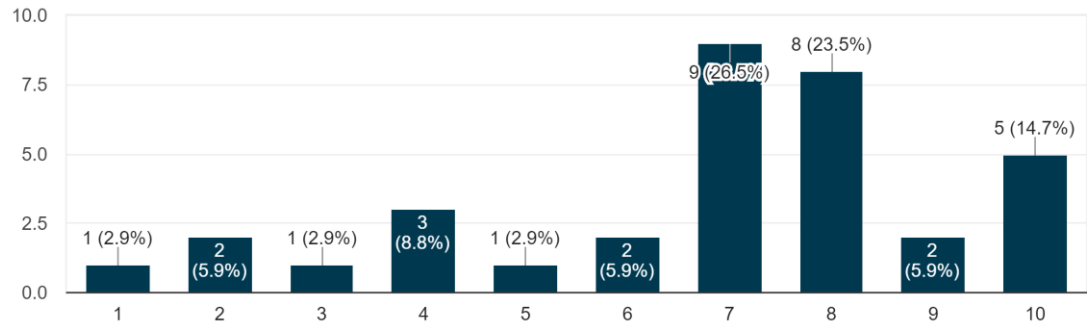
Favorite players and voting the best player at the end of the season

34 responses



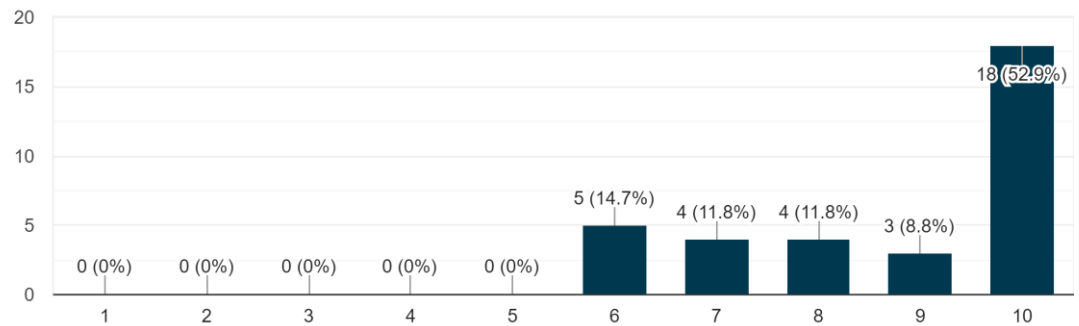
Instagram linked to app with #acoulu tag and AC Oulu account with players public accounts

34 responses



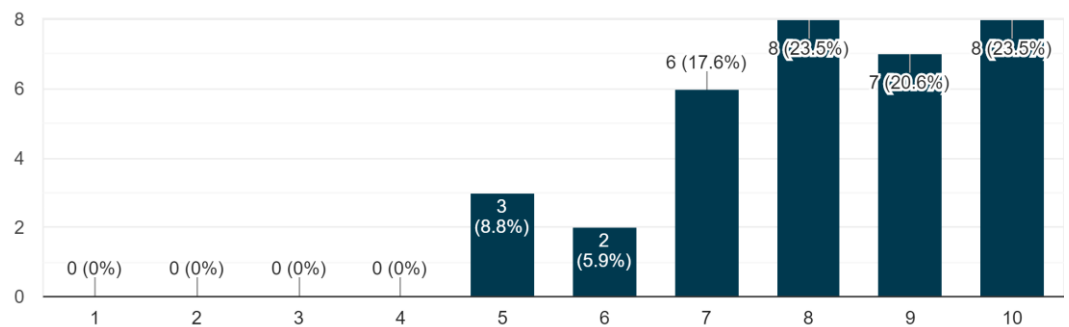
AC Oulu ACIAA -podcast directly in the app

34 responses



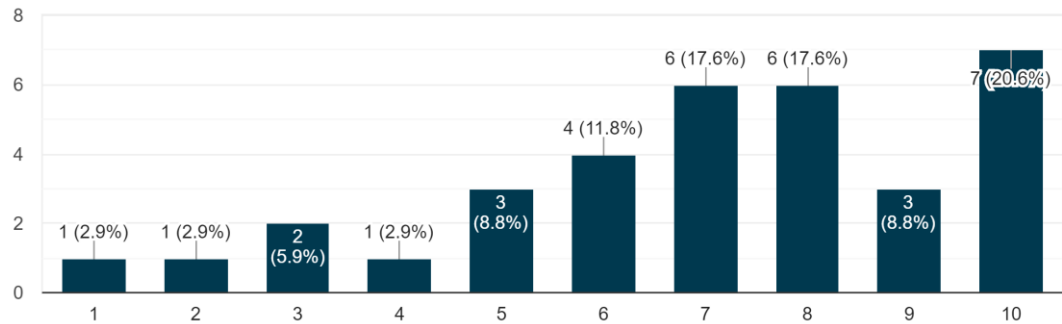
Quick feedback feature of home matches

34 responses



Quiz about club history and statistics

34 responses



7. Own development idea or improvement?

(8 responded)

- Casting an AC Oulu MOTM vote would give a chance to win some small prize
- Push notifications about supporters away trips and ability to enroll to the away trip
- Referees and linesmen listed in live match center
- Upcoming matches as push notifications
- Alarm clock with AC Oulu goal song
- Recipe for a famous food portion served in home games
- My day players videos to the app
- More integrated content to the app. As an example, news from AC Oulu website should be opened in the app.

8. Free feedback about the app

(6 responded)

- The app has good combination features and it is clear to use.
- The basis of the app is good. The app should remind about new updates or update automatically.
- Nice application!
- Good and handy app. Listed new features would increase usage rate drastically.
- Fine app and it is great that the app is developed better!
- Especially season tickets available digitally in the app would be great.

9. E-mail address to ticket draw (Voluntary)

21 people submitted their email addresses.